US005657610A

United States Patent [19]

Dietrich et al.

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[45] Date of Patent: Aug. 19, 1997

[54] **PACKAGING MACHINE**

[75] Inventors: **Walter Dietrich**, Weinstadt; **Manfred Hermann**, Korb; **Guenter Loew**, Waiblingen; **Eberhard Krieger**, Weinstadt, all of Germany

[73] Assignee: **Robert Bosch GmbH**, Stuttgart, Germany

[21] Appl. No.: **569,213**

[22] PCT Filed: **May 4, 1995**

[86] PCT No.: **PCT/DE95/00586**

§ 371 Date: **Dec. 15, 1995**

§ 102(e) Date: **Dec. 15, 1995**

[87] PCT Pub. No.: **WO95/31372**

PCT Pub. Date: **Nov. 23, 1995**

[30] **Foreign Application Priority Data**

May 13, 1994 [DE] Germany 44 16 891.8

[51] **Int. Cl.**[6] **B65B 61/16**; B65B 43/26

[52] **U.S. Cl.** **53/139.5**; 53/566; 53/252; 493/312

[58] **Field of Search** 53/564, 566, 252, 53/139.5; 493/312, 313, 315, 316, 317; 206/485, 486, 489

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Primary Examiner—Linda Johnson
Assistant Examiner—John Paradiso
Attorney, Agent, or Firm—Michael J. Striker

[57] **ABSTRACT**

A packaging machine (**10**) for processing fold boxes (**15**) with integrated support frames (**25**) has respectively one raising element (**47**) moving along with each fold box (**15**), which raises the support frame (**25**) lying flat against the inside of the fold box (**15**). A support element (**50**) is furthermore associated with each raising element (**47**), which interlockingly supports the support frame (**25**) during the insertion of objects (**30**, **35**) into the fold box (**15**).

7 Claims, 3 Drawing Sheets

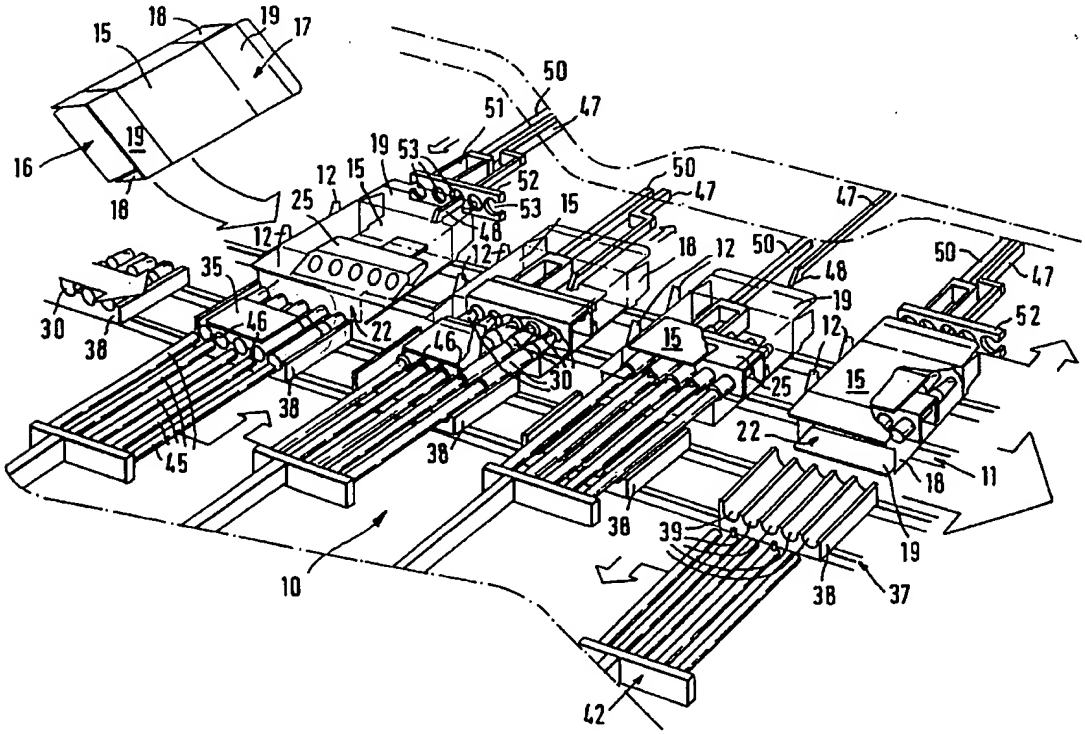


FIG. 1

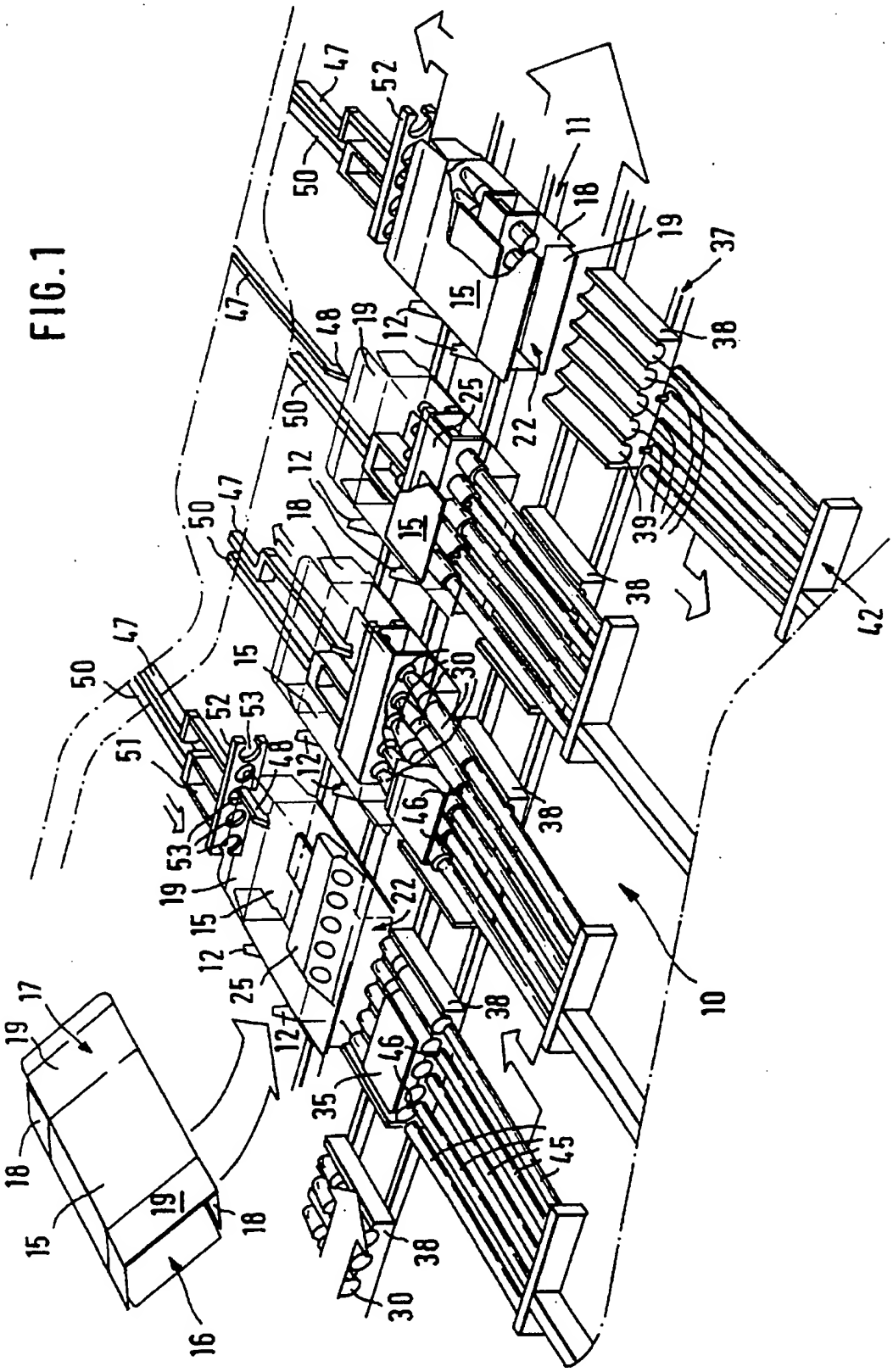
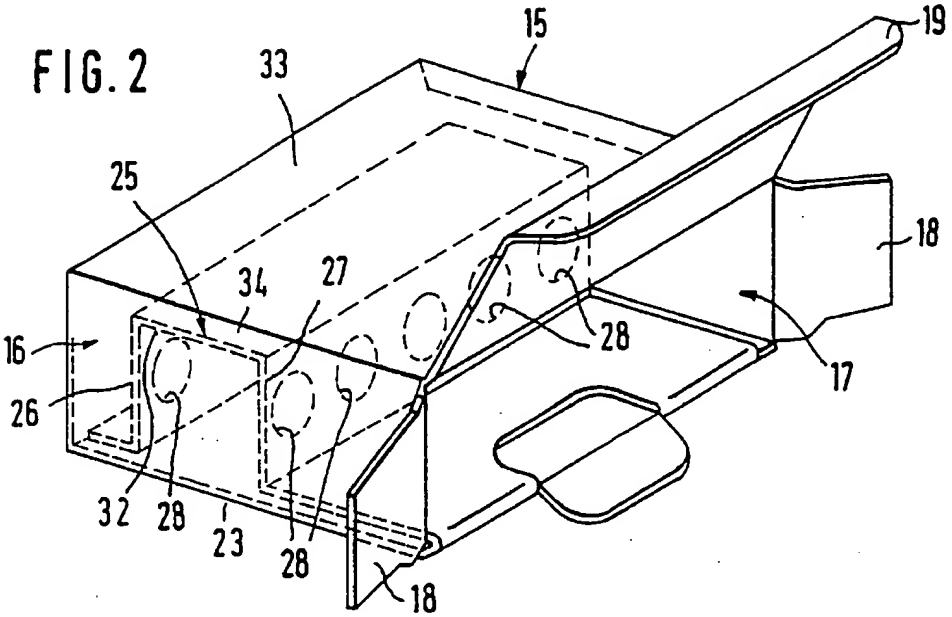


FIG. 2



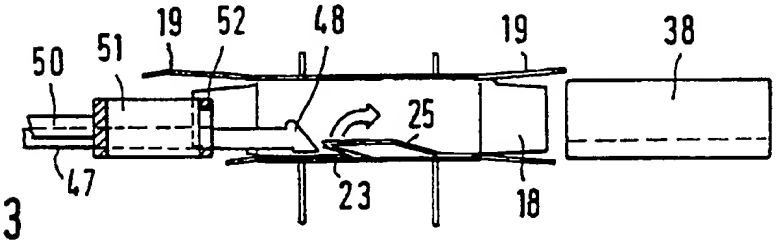


FIG. 3

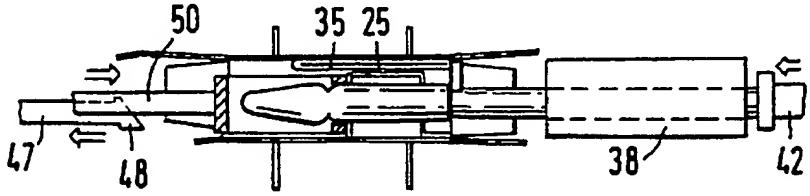


FIG. 4

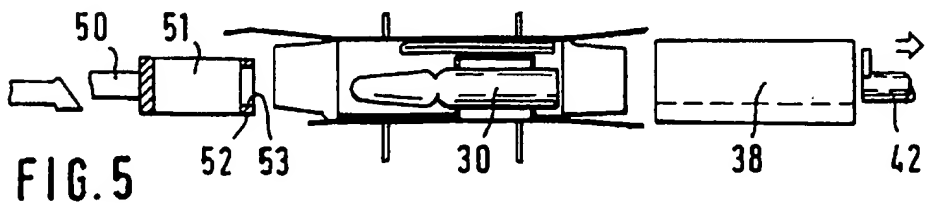


FIG. 5

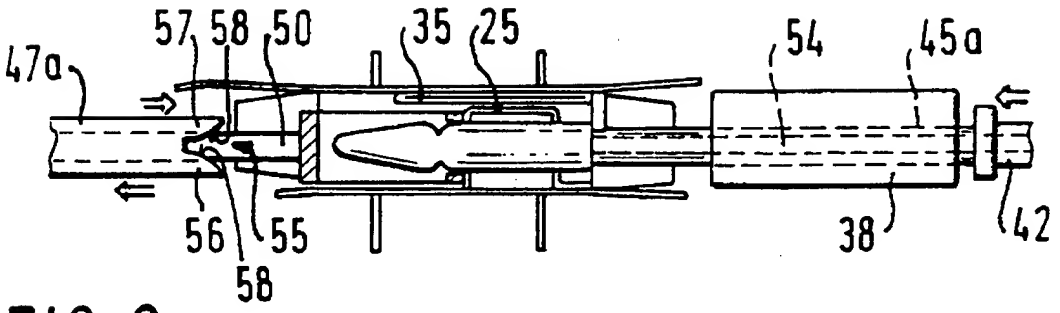


FIG. 6

PACKAGING MACHINE

PRIOR ART

The invention is based on a packaging machine in accordance with the preamble of claim 1. In such a packaging machine known, for example, from EP 0 465 437 A1, upright fold boxes which reveal an opening cross section are conveyed along a horizontal conveying path. Several blister strips, placed on top of each other and with a packing slip enclosing them in a U-shape, are respectively conveyed in a product bowl parallel and aligned with the fold boxes. The contents of the product bowls are pushed into the fold boxes by inserting slides associated with the product bowls and the fold boxes are subsequently closed. Packaging machines of this type are particularly suited for packing sturdy goods which completely fill the opening cross section. Fold boxes with an integrated support frame for packaging delicate objects, such as ampuls, vials and the like, now have become known from the German Utility Model Application G 93 04192.6, for example. The support frame is integrally connected with a wide interior wall of the folding box and, since it can be bent over flat against the interior wall, allows the flat transport and storage of such fold boxes. However, these fold boxes cannot be processed in the known packaging machine described above since, after putting the fold box upright, the support frame lies flat at least in part, and therefore the objects cannot be inserted into the receptacles for the object formed in the support frame.

It is therefore the object of the invention to disclose a packaging machine in which fold boxes with integrated support frames can also be processed.

ADVANTAGES OF THE INVENTION

In contrast to this, the packaging machine in accordance with the invention having the characterizing features of claim 1 has the advantage that fold boxes with integrated support frames can also be dependably processed.

Further advantages and advantageous embodiments ensue from the dependent claims and the specification. Dependable raising in connection with different support frame designs is achieved by means of the wedge-shaped design of the raising elements. The objects can be inserted into the support frame particularly well, if the latter is held by a support element during the insertion. Tilting of the objects during insertion can be prevented by a special embodiment of the inserting slides. Jamming of the support frame can be prevented by an appropriate embodiment of the raising elements.

DRAWINGS

An exemplary embodiment of the invention is represented in the drawings and will be explained in detail in the following description. FIG. 1 shows a section of the packaging machine in accordance with the invention in a simplified perspective view, FIG. 2 shows a fold box with an integrated support frame in a perspective view, FIGS. 3 to 5 represent cross sections through the packaging machine of FIG. 1 in different work phases, and FIG. 6 shows a cross section in accordance with FIG. 4 in an altered embodiment.

DESCRIPTION OF THE EXEMPLARY EMBODIMENT

A horizontal conveying path of a packaging machine **10** is shown in FIG. 1, wherein fold boxes **15** are continuously conveyed between pushers **12** disposed at even distances on a conveyor belt **11**. The fold boxes **15**, which at first lie flat, are taken from a magazine stack by means of removal, raising and transfer devices (not shown), known per se, and are inserted with raised lateral walls between the pushers **12**. On their two opposite ends **16**, **17**, the fold boxes **15** have closure flaps **18**, **19**, which are bent away in the section of the horizontal conveying path shown, by guide rails, also known and not shown, so that the full opening cross section **22** of the fold box **15** is open. Each fold box **15** (FIG. 2) has in its interior a support frame **25**, integrally connected with a wide lateral wall **23** and having interlocking receptacles in the shape of openings **28** for sensitive objects such as ampuls **30** or vials, for example, in wall sections **26**, **27** extending perpendicularly from the wide lateral wall **23**. A pocket **34** is formed between an intermediate wall **32** connecting the wall sections **26**, **27**, and a second wide lateral wall **33** of the fold box **15**, in which a folded packing slip **35** can be inserted.

Product bowls **38**, in whose depressions **39** the ampuls **30**, intended for a folding box **15**, as well as the packing slip **35** placed on the ampuls **30**, are conveyed, are arranged, aligned with the fold boxes **15** and moving along with the fold boxes **15**, on a second conveyor belt **37**. The arrangement of the ampuls **30** and the packing slip **35** in the product bowl **38** is such that they are aligned with the openings **28** or the pocket **34** when the support frame is raised.

An insertion device **42**, aligned with each product bowl **38**, is associated with the latter, whose insertion slides **45**, adapted to the number and shape of the ampuls **30**, can be moved crosswise to the conveying direction of the fold boxes **15** into the latter. Furthermore, two pins **46** used as a stop for the packing slip **35**, are disposed on at least two insertion slides **45**, which are respectively associated with a product bowl **38**.

A raising element **47** is associated with each fold box **15** on the side opposite the insertion slides **45**, which moves along with it and can be displaced, centered with its opening cross section **22**, into the folding box **15**. On its tip **48** facing the wall section **27** of the support frame **25**, the pin shaped raising element **47** is embodied in a wedge-shape, so that the underside of the tip **48** approximately ends at the inside of the wide lateral wall **23**.

A support element **50** can also be moved crosswise to the conveying direction of the fold box **15** with which it is associated. The support element **50** has a fork-shaped support **51** which is arranged approximately parallel with the pin-shaped raising element **47**. The support **51** has at its tip a support face **52** with cutouts **53** adapted to the opening cross section **22** of the fold box **15** and to the openings **28** of the support frame **25**. The cutouts **53** are of such a size that they have a larger opening than the openings **28** and can furthermore be penetrated by the tip **48** of the raising element **47**.

The above described packaging machine **10** operates as follows:

The product bowls **38** equipped with the ampuls **30** and the packing slip **35** move along parallel and aligned with the raised fold boxes **15**, which are continuously conveyed between the pushers **11**. So that the ampuls **30** in particular can be pushed into the openings **28** formed in the support frame **25**, the support frame, which still rests flat against the lateral wall **23** after the fold box **15** has been raised, must be raised, so that the two wall sections **26**, **27** with the openings **28** project perpendicularly away from the lateral wall **23**. For this purpose the raising element **47** is moved crosswise to the conveying direction of the fold box **15** into its opening **17**

(FIG. 3). The wedge-shaped tip 48 of the raising element 47 catches the wall section 27 of the support frame 25, which faces it and is folded parallel with the lateral wall 23, and raises it together with the support frame 25.

As soon as the support frame 25 has been raised, the raising element 47 is moved back and the support element 50 is inserted into the opening 17 far enough so that its support face 52 places the entire surface of the support frame 25 against the wall section 27 (FIG. 4). In this position the openings 28 of the support frame 25 are aligned with the ampuls 30 in the product bowl 38. Now the inserting slides 45 of the insertion device 42 are moved crosswise to the conveying direction of the fold box 15 in such a way, that the ampuls 30 and the packing slip 35 are pushed through the opening 16 into the cutouts 28 of the support frame 25 or into the pocket 34. The support frame 25 is maintained in the intended position by the interlocking placement of the support face 52 of the support element 50 during the entire insertion of the ampuls 30 into the support frame 25. As soon as the inserting slides 45 have pushed the ampuls 30 into the intended position in the fold box 15, they and the support element 50 are moved out of the fold box 15 (FIG. 5). The fold box 15 is subsequently moved on to a closing installation for closing the closure flaps 18, 19.

To ease the insertion of vials in particular, and of similar objects, whose diameter is almost constant in the area of their tops, the inserting slides 45*a* have been modified in FIG. 6 by a respective, concentrically arranged suction bore 54. The suction bores 54 which are connected with a vacuum source, not shown, terminate in the front faces of the inserting slides 45*a* facing the ampuls 30. If the suction bores 54 are charged with a vacuum during the insertion of the ampuls 30 into the fold box 15, the ampuls 30 are pulled by suction against the inserting slides 45*a* and are horizontally aligned with them. Tilting and thus jamming, for example, of the ampuls 30 against the support frame 25 is prevented during the insertion by means of this.

The raising element 47*a* furthermore has a U-shaped cross section with an opening 55 facing the support frame 25. The two legs 56, 57 of the raising element 47*a* flanking the opening 55 are respectively designed as wedge shapes. Their faces 58 facing the opening 55 are concavely shaped in the exemplary embodiment, however, they can also be flat-shaped, for example. During raising, the support frame 25 is guided by the upper leg 57 in such a way that it becomes also possible to raise support frames which are critical in the size of their sections or in their folding process.

In addition it should be pointed out that, depending on the design of the support frame 25 and the objects to be packaged, it would also be conceivable to replace the raising element 47, 47*a* and the support element 50 by a single element which takes on the functions of both elements 47 or 47*a* and 50. It is furthermore possible to omit a support element 50 if there is an appropriately stiff support frame 25, or with openings 28 of the support frame 25 in which the objects are disposed with play, and to raise the support frame 25 merely by means of a raising element 47, 47*a*.

We claim:

1. A packaging machine (10) for inserting objects (30, 35) into fold boxes (15) having an integrated support frame (25) with openings formed therein, which is initially disposed lying flat within the fold box, said machine comprising:

a horizontal conveying path, pushers (12) conveying the fold boxes (15) at equal distances along said horizontal conveying path;

product bowls (38) which feed the objects (30, 35) to be packaged and move along a portion of the conveying path of the fold boxes (15) and are aligned with them;

inserting slides (45, 45*a*) also moving along in alignment with the product bowls (38) and the pushers (12) over a portion of the conveying path and on a side of the fold boxes (15), which push respectively at least one object (30, 35) out of a product bowl (38) into a frame opening in a fold box (5) while they are aligned with the product bowl (38) and the fold boxes (15) and which thereafter return into their initial position;

raising elements (47, 47*a*) disposed to move along on the side opposite the inserting slides (45, 45*a*) in alignment with the fold boxes and which, during said alignment with the fold boxes (15), are disposed to be moved crosswise to the conveying direction of the fold boxes (15) prior to and/or during the insertion of the objects (30, 35) by the inserting slides into the fold boxes (15) and which raise the initially flat-lying support frames (25) inside the raised fold boxes (15) so that said openings (28) formed in the support flames (25) are aligned flush with the objects (30, 35) during their insertion.

2. A packaging machine in accordance with claim 1, characterized in that the raising elements (47, 77*a*) are at least partially embodied to be wedge-shaped at their tips (48) facing the support frame (25), so that the wedge-shaped area acts on the flat-lying wall (27) of the support frame (25) facing the raising element (47, 47*a*).

3. A packaging machine in accordance with claim 1, characterized in that a support element (50) for the support frame (25) is disposed in alignment with each raising element (47, 47*a*), which is in contact with the raised support frame (25) during the insertion of the objects (30, 35) into the support frame (25), and aligns its openings (28) with the objects (30, 35).

4. A packaging machine in accordance with claim 3, characterized in that the raising element (47, 47*a*) and the support element (50) can be moved separately of each other crosswise in respect to the conveying direction of the fold boxes (15).

5. A packaging machine in accordance with claim 3, characterized in that the support element (50) has a support face (52) adapted to the openings (28) of the support frame (25).

6. A packaging machine in accordance with claim 1, characterized in that the raising element (47*a*) is embodied to be U-shaped in cross section and has two legs (56, 57), whose faces (58) facing the opening (55) of the raising element (47*a*) are concavely designed.

7. A packaging machine in accordance with claim 1, characterized in that the inserting slides (45*a*) have suction bores (54) which terminate in the front faces of the inserting slides (45*a*) facing the objects (30).

* * * * *

United States Patent [19]

Aterianus

[11] **4,106,262**

[45] **Aug. 15, 1978**

[54] **WRAPPING MACHINE AND METHOD WITH FOUR SIDE ROTARY TUCKER**

[75] Inventor: **John S. Aterianus**, Green Bay, Wis.

[73] Assignee: **FMC Corporation**, San Jose, Calif.

[21] Appl. No.: **658,448**

[22] Filed: **Feb. 17, 1976**

Related U.S. Application Data

[62] Division of Ser. No. 581,993, May 29, 1975.

[51] **Int. Cl.**[2] **B65B 9/10**

[52] **U.S. Cl.** **53/28**

[58] **Field of Search** ..... 53/28, 33, 180 R, 180 M, 53/182 R, 182 M, 226, 22 A, 373; 93/12 R, 35 SB

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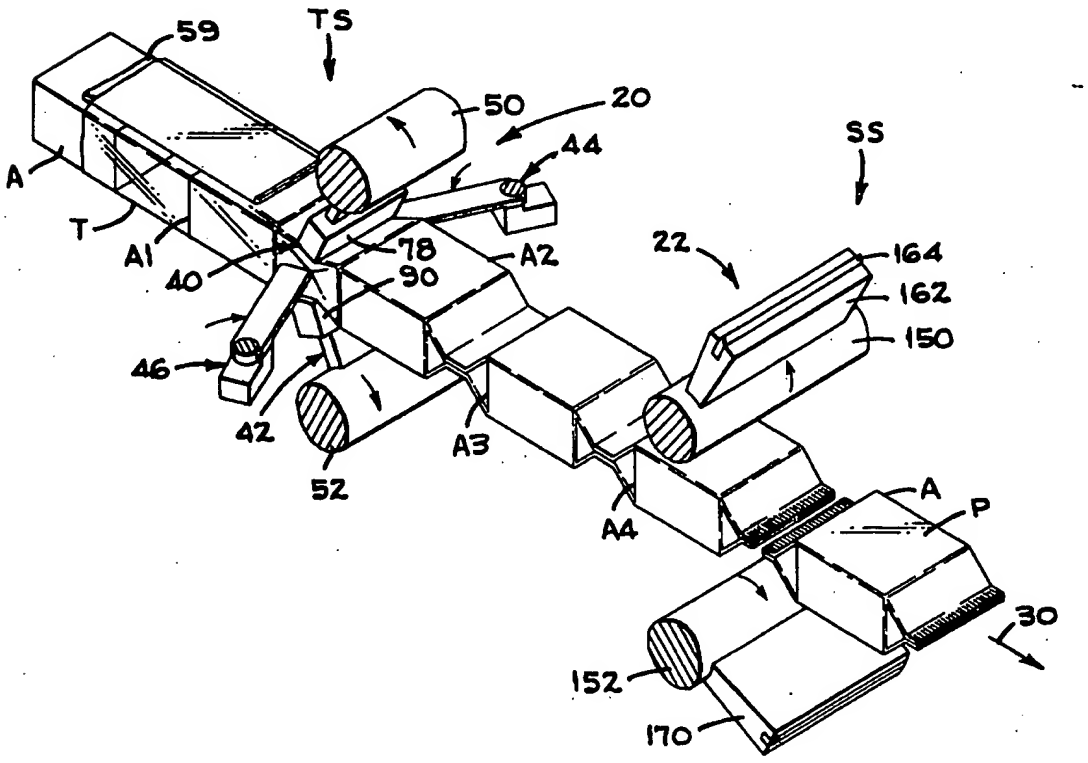
Primary Examiner—Othell M. Simpson
Assistant Examiner—John Sipos
Attorney, Agent, or Firm—C. E. Tripp

[57] **ABSTRACT**

A wrapping machine and method is provided which forms a tube of wrapping material around spaced articles to be packaged. A four side rotary tucker cooperates with a crimping, sealing and cut-off mechanism to produce uniformly tucked, crimped end style packages with articles in packages after air has been discharged from reduced cut-off length with the result that wrapping material costs are minimized while package appearance is improved. The wrapping machine is readily adjustable to handle articles of different cross sections and lengths, and means are provided for removing air from the tube of wrapping material.

1 Claim, 22 Drawing Figures



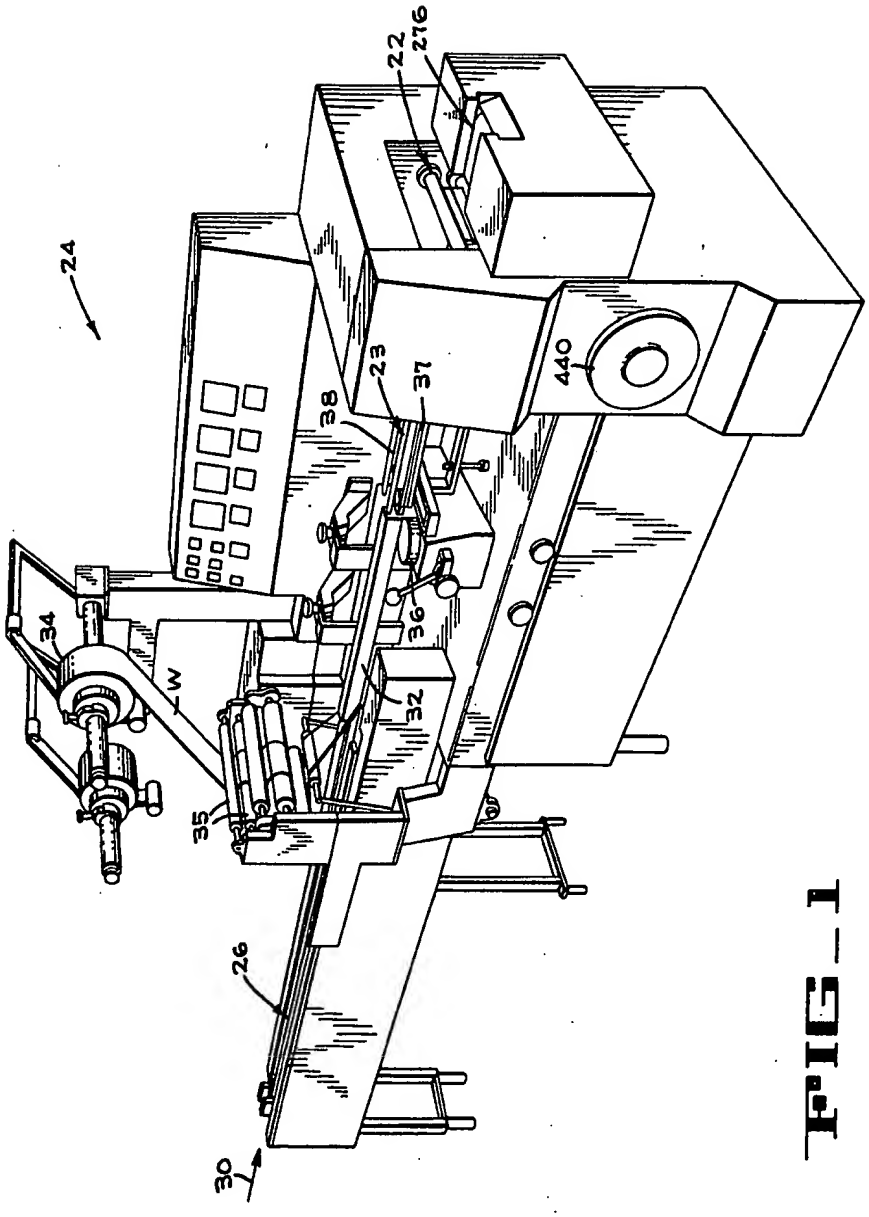


FIG_1

FIG-2

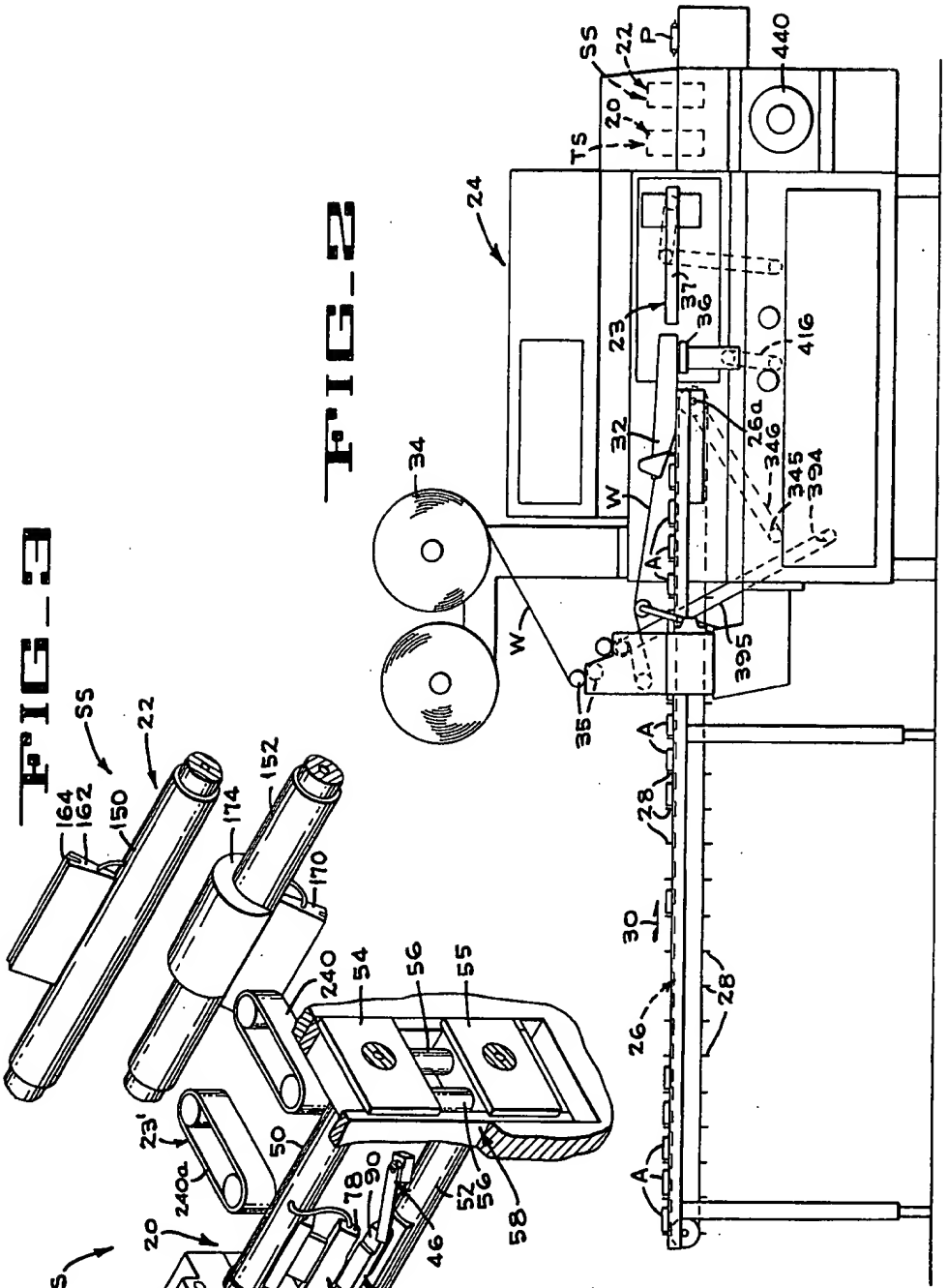

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FIG-3

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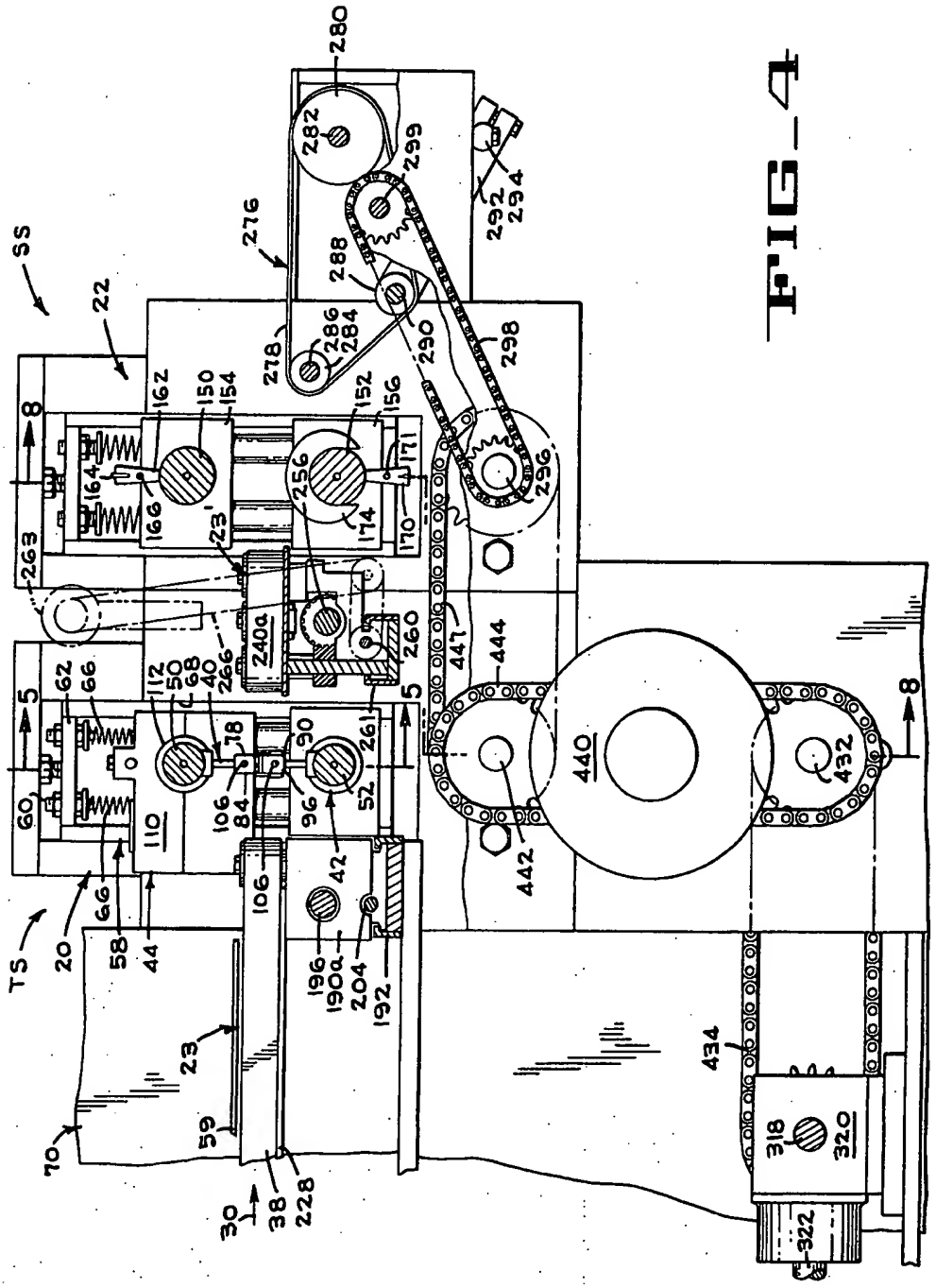
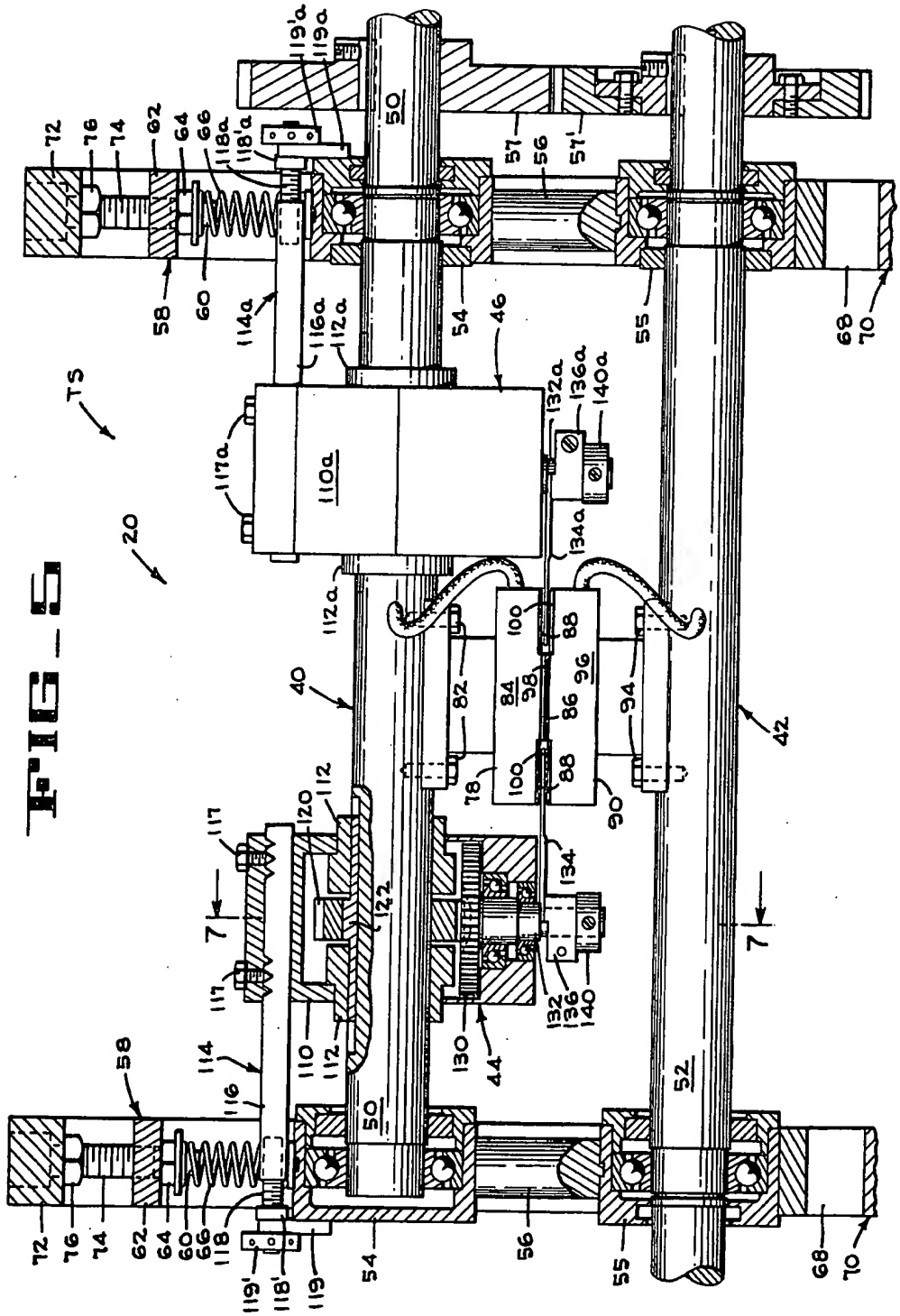


FIG_4



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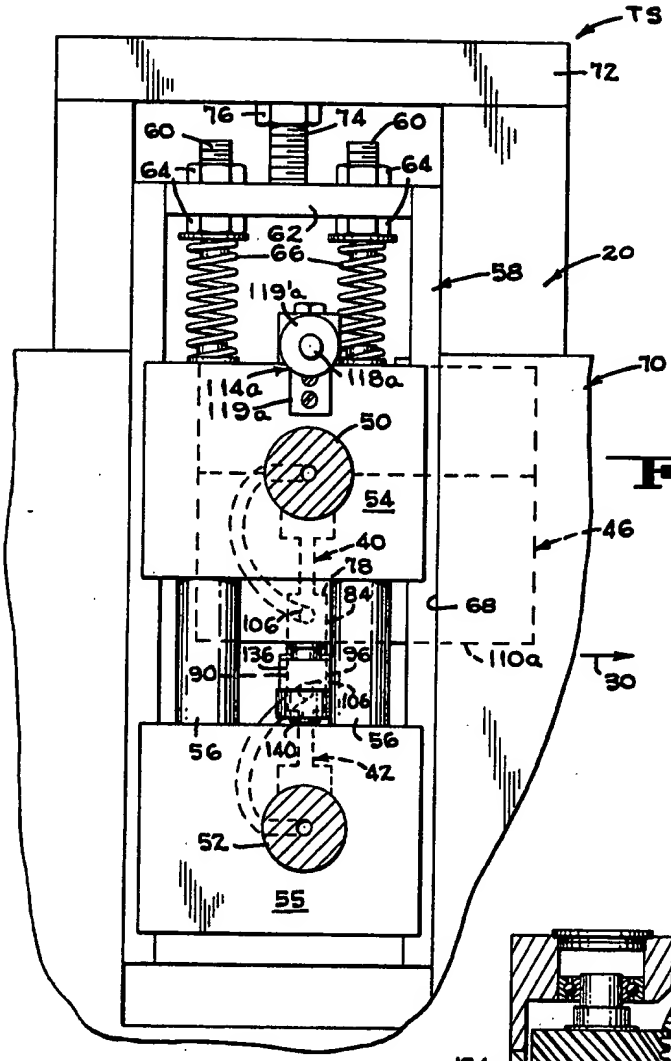
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FIG_6

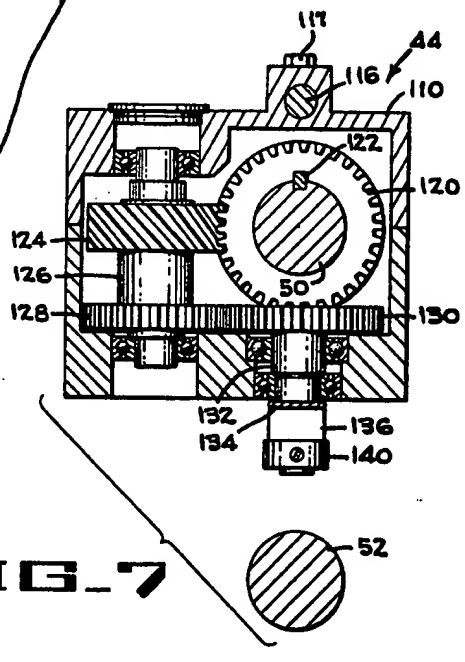
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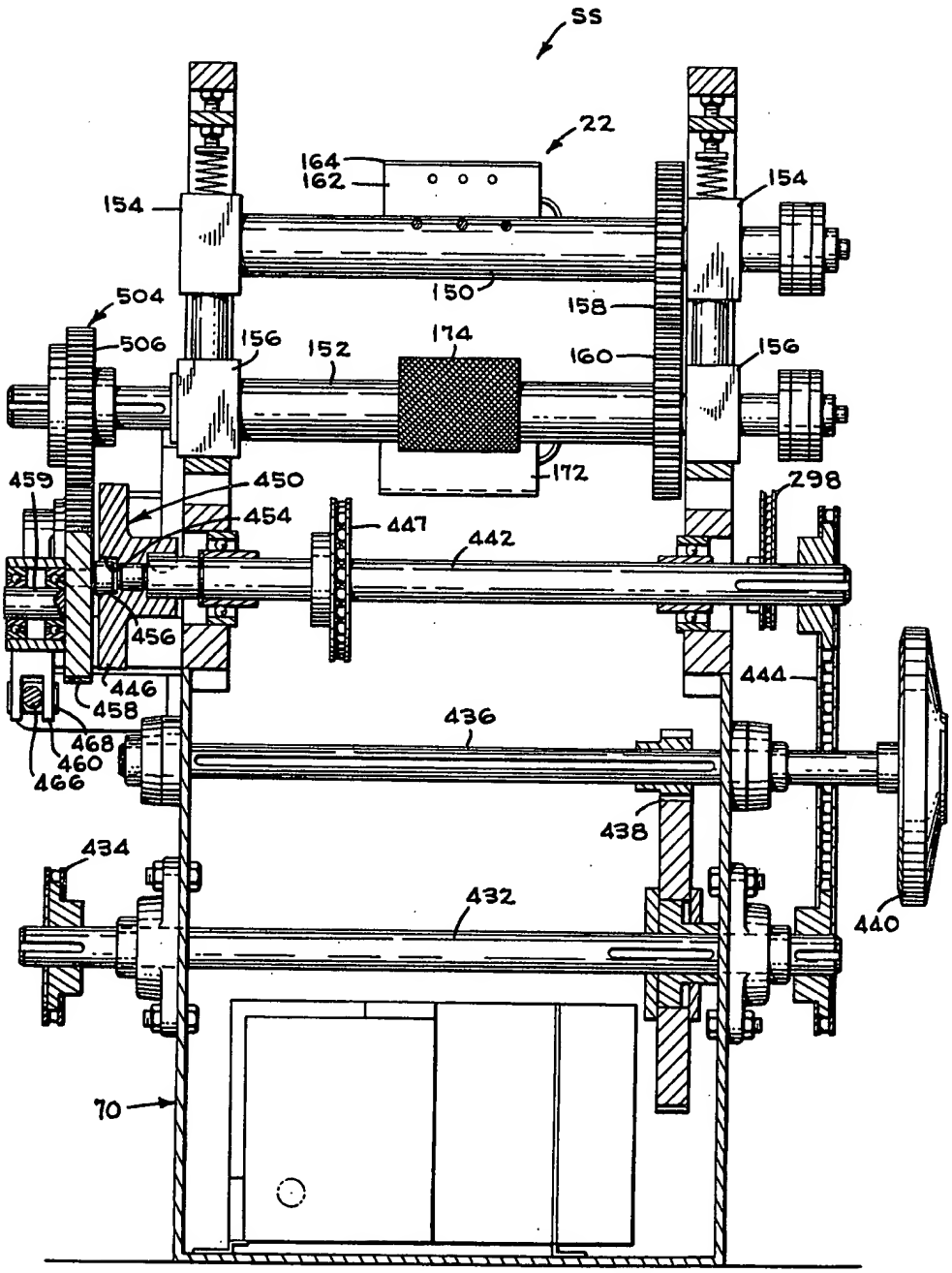
FIG_7

FIG_8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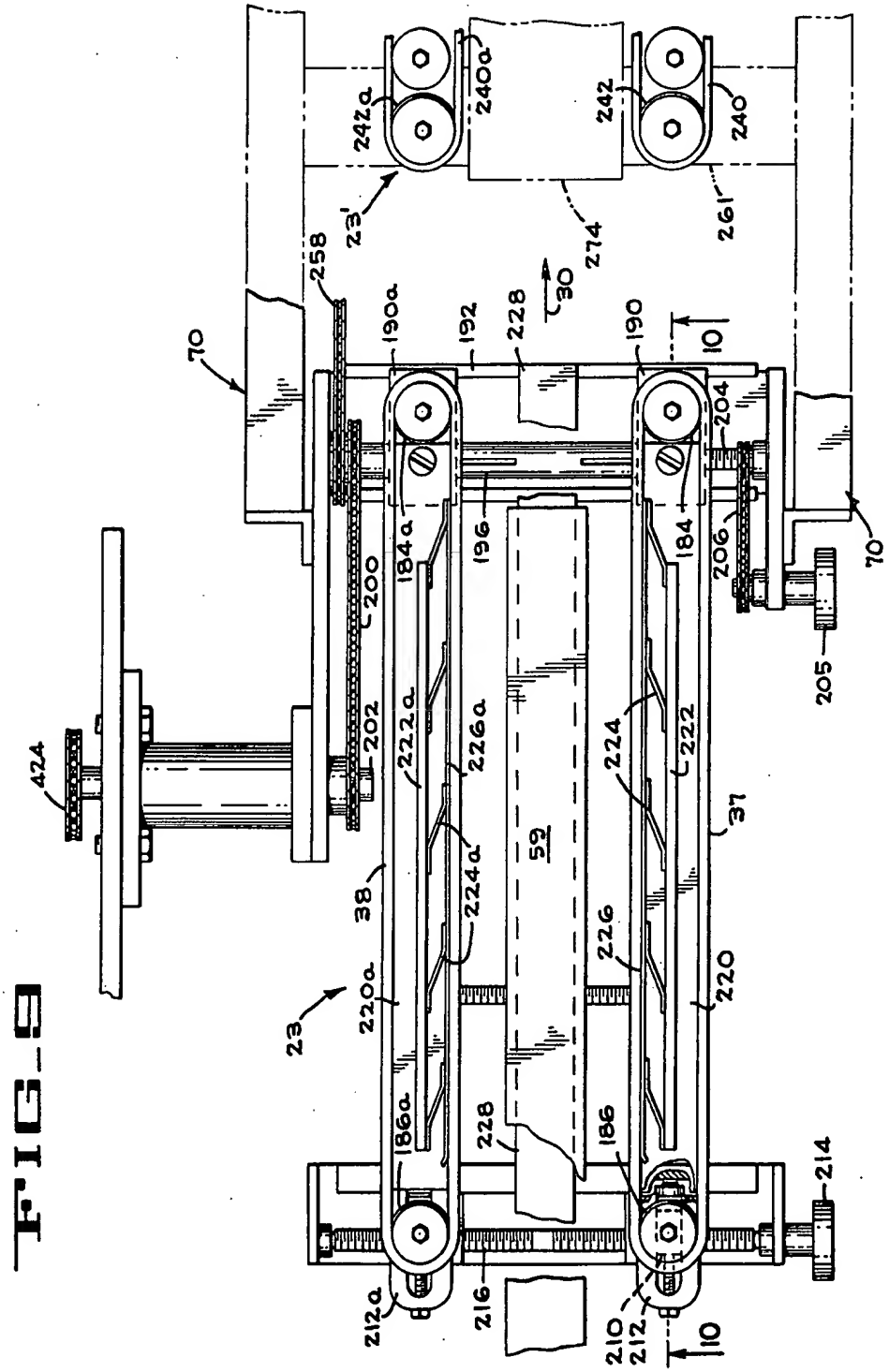
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FIG. 9

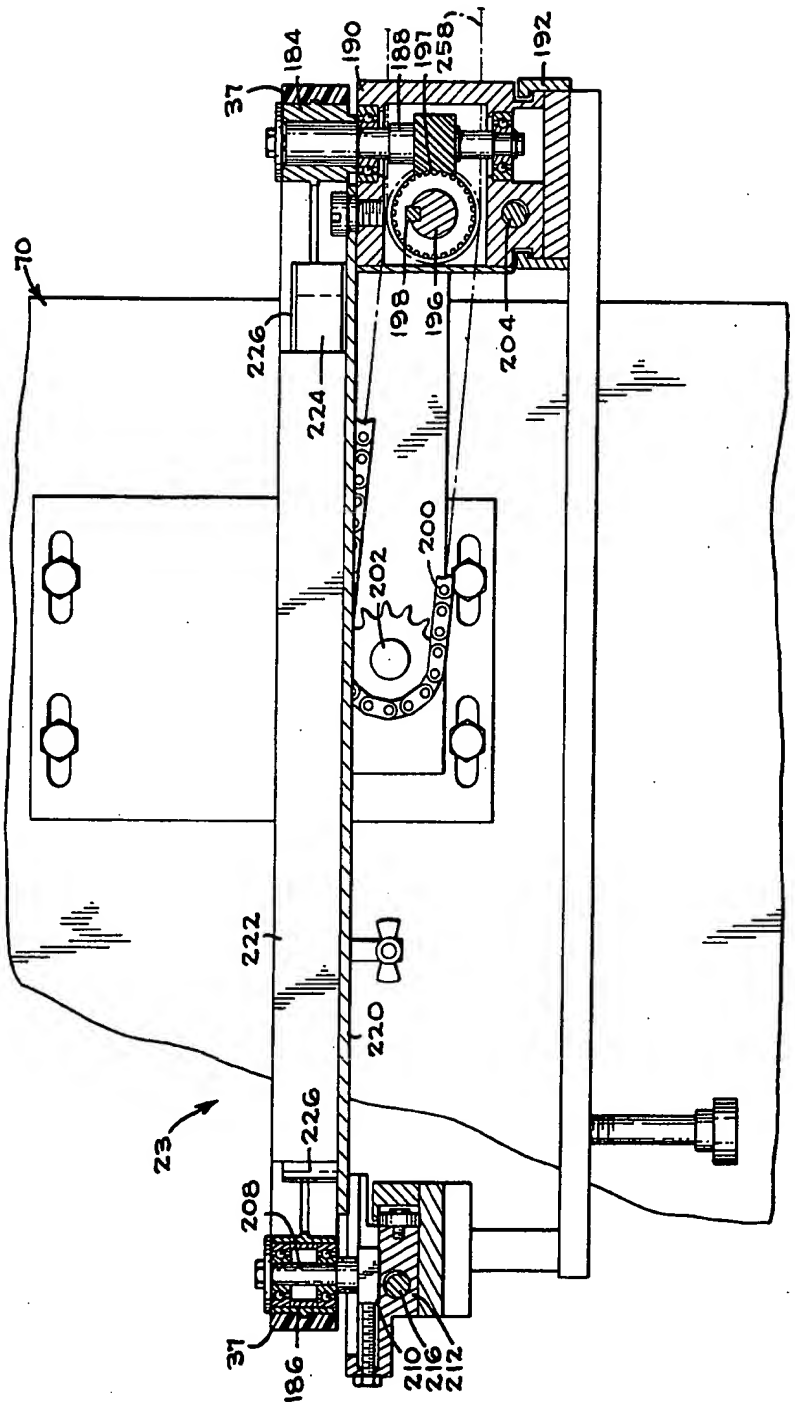
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FIG 10

FIG_11

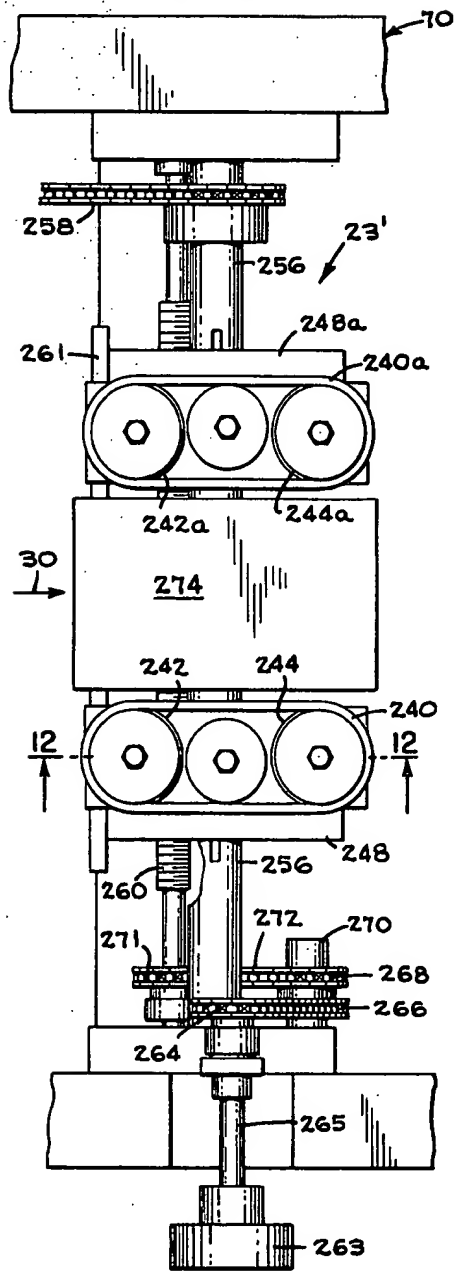
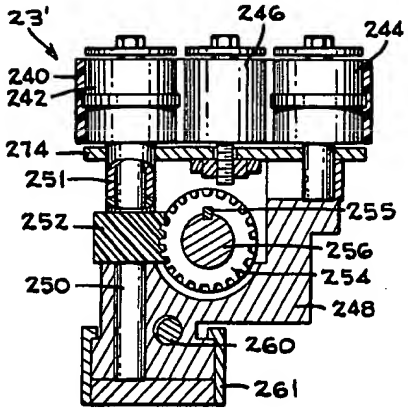


FIG_12



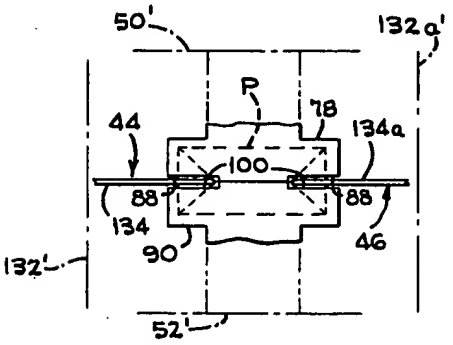


FIG_18

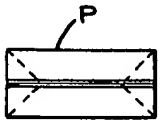
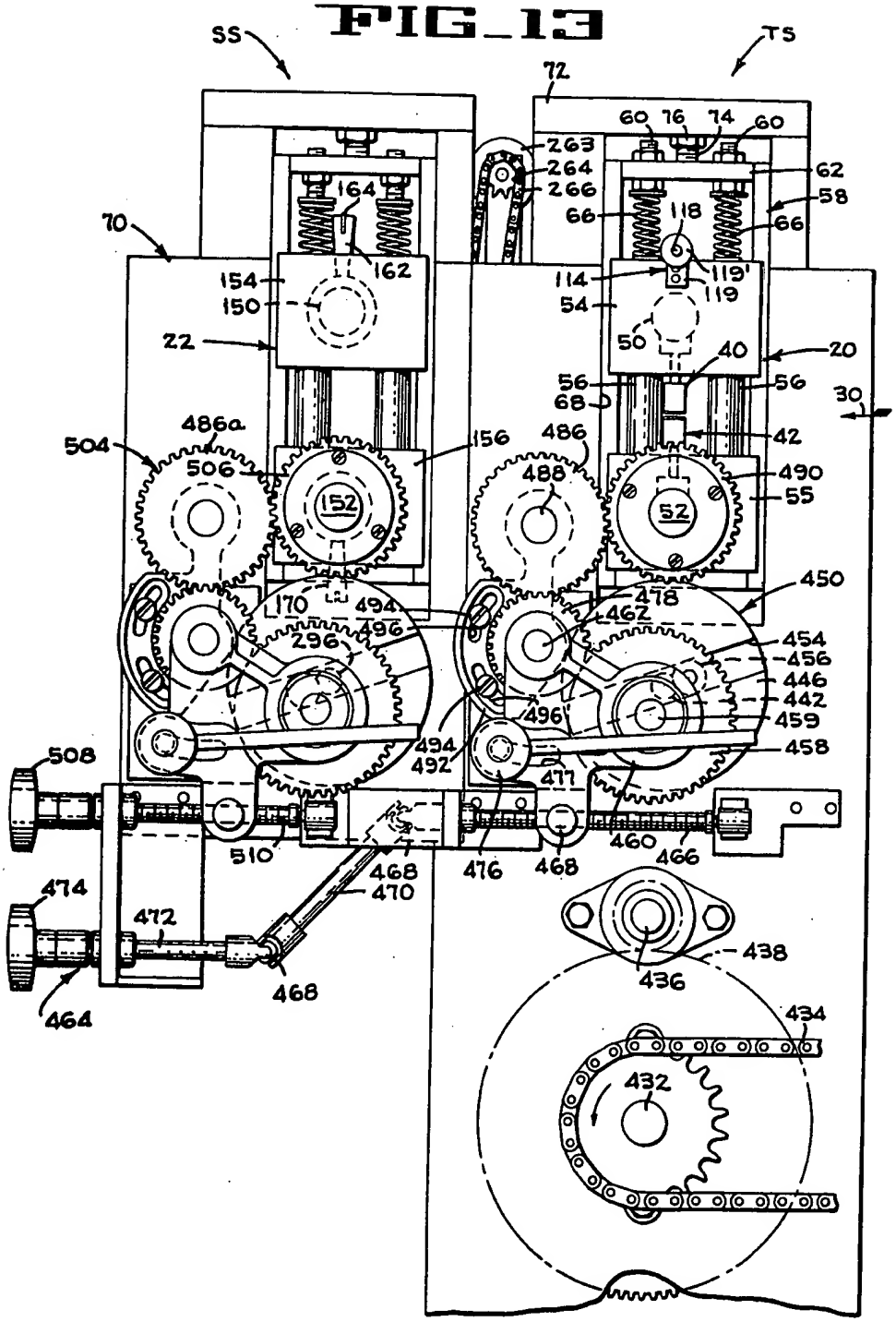


FIG_19

FIG_13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55
152
52
450
170
494
496
296
478
462
454
456
446
442
459
458
496'
494
492
477
508
510
468
470
476
468
460
466
474
472
468
464
438
436
434
432

FIG_14

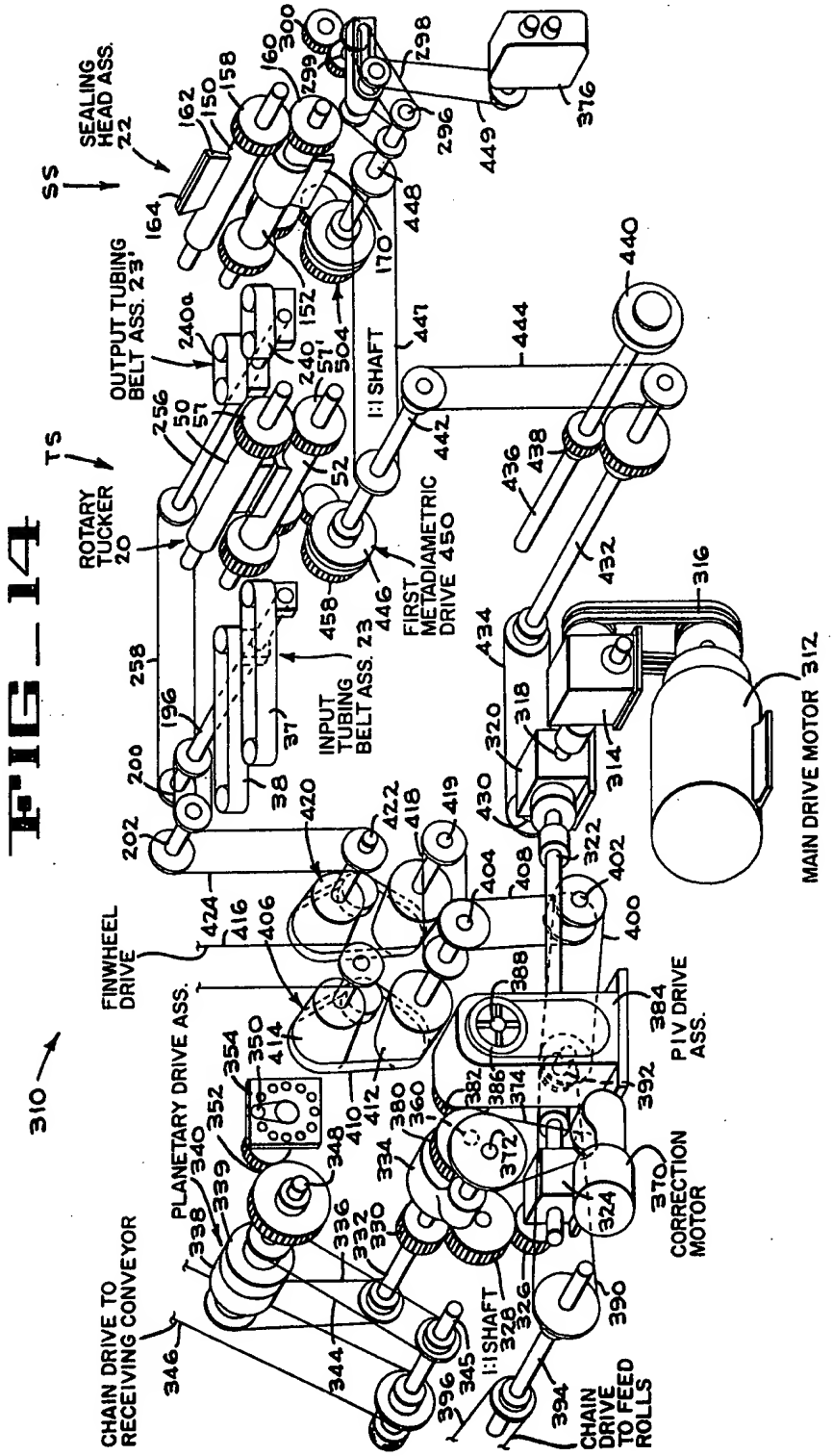

SEALING HEAD ASS. 22
SS
TS
ROTARY TUCKER 20
OUTPUT TUBING BELT ASS. 23'
INPUT TUBING BELT ASS. 23
FIRST METADIAMETRIC DRIVE 450
I:I SHAFT
MAIN DRIVE MOTOR 312
FINWHEEL DRIVE
PLANETARY DRIVE ASS.
P I V DRIVE ASS.
CORRECTION MOTOR
CHAIN DRIVE TO RECEIVING CONVEYOR
CHAIN DRIVE TO FEED ROLLS
310

FIG_15

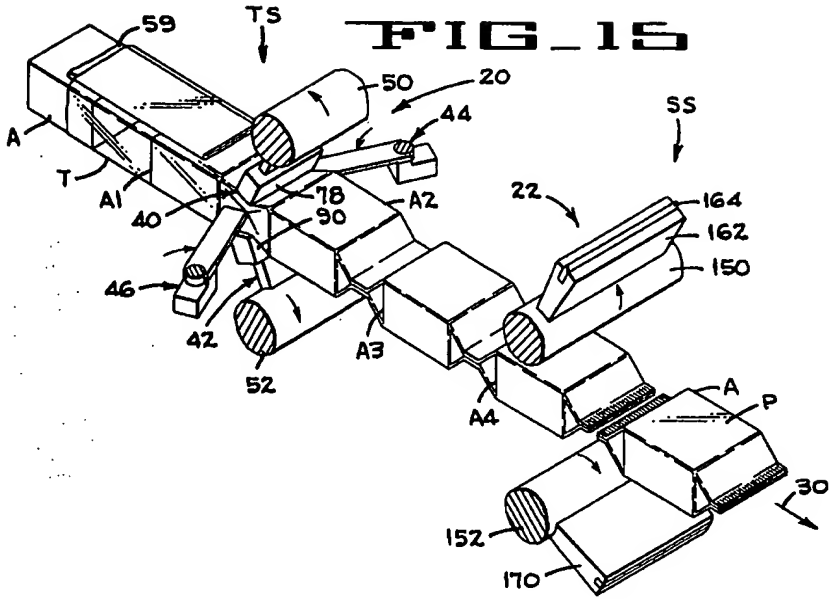
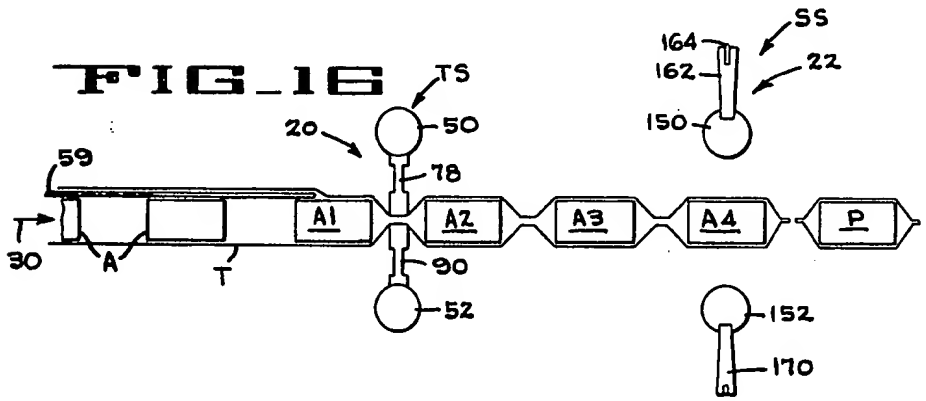


FIG_16



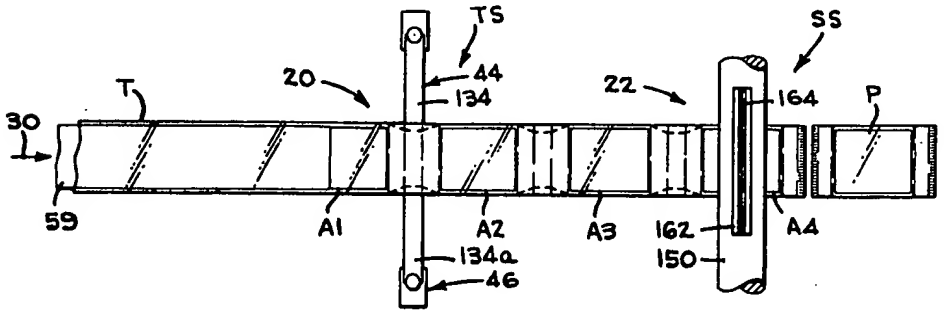


FIG_17

FIG_20

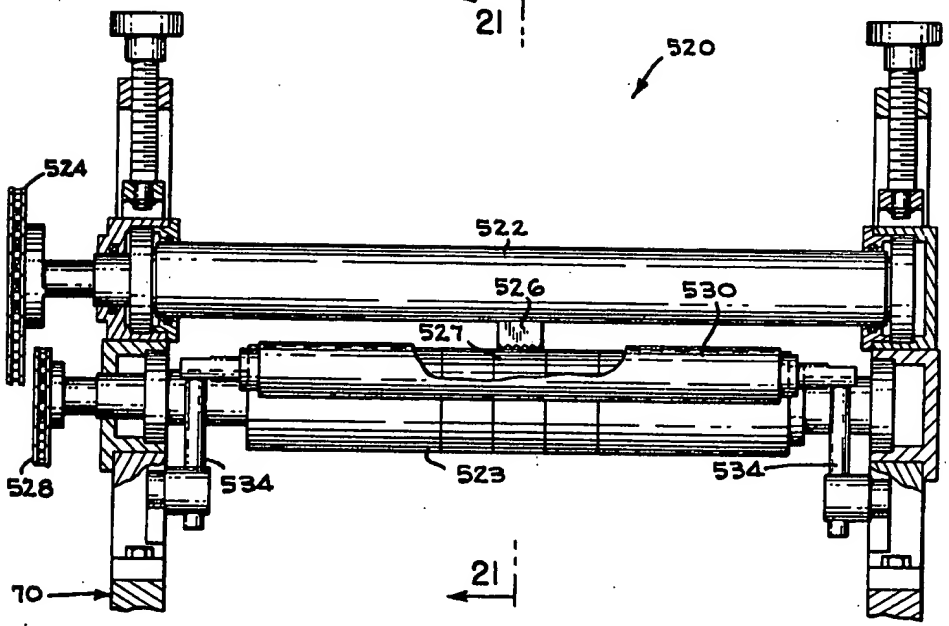


FIG_22

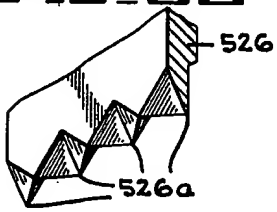


FIG_21

WRAPPING MACHINE AND METHOD WITH FOUR SIDE ROTARY TUCKER

This is a division, of application Ser. No. 581,993 filed May 29, 1975.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to wrapping machines for forming article filled, crimped end style packages formed from a flat web into a tube of wrapping material with the articles spaced therein. The machine simultaneously tucks all four sides of the film inwardly at a single station while evacuating substantially all the air from the packages resulting in a tighter tuck between the end extensions of the packages.

2. Description of the Prior Art

Wrapping machines which form tubes of wrapping material or film around spaced articles are well known in the art. Campbell U.S. Pat. No. 2,546,721 which issued on Mar. 27, 1951 discloses one such machine which forms article filled packages and utilizes pleating rollers on cam operated pivot arms to tuck in the package sides at a station upstream of the transverse crimping and cutoff station. Cam operated tuckers are now common in the art, however the method does not permit minimization of package length because the tuckers do not travel with the web while tucking and also cam pressure angles become excessive. The tucking operation reliability suffers when attempts are made to minimize package length.

The United States Patents to Kraft U.S. Pat. Nos. 3,090,174 which issued on May 21, 1973 and 3,439,174 which issued on Apr. 22, 1969 disclose the combination of a sealer and a tucker which provides tight tucks between spaced articles in a tube of wrapping material by tucking the material inwardly from all four sides. However, the Kraft patents utilize a series of equally spaced flexible tucking lugs attached to upper and lower flexible belts for tucking the upper and lower walls of a tube of wrapping material inwardly. Thus, Kraft's upper and lower tucker lugs are limited to a specific package size and cannot be adjusted to accommodate packages of different sizes. Kraft's unheated tucking lugs do not tack the flap material together at the tuck, and accordingly must remain in contact with the packaging material for a substantial linear distance and up to a point immediately adjacent the sealer.

SUMMARY OF THE INVENTION

The wrapping machine of the present invention forms a tube of wrapping film around a continuously moving row of relatively closely spaced articles. Air is evacuated from the tube of wrapping material at the tucking station either by drawing a vacuum through a flat vacuum tube inserted between the articles and the wrapping material, or by providing perforations in the wrapping material to allow for air escapement and subsequently sealing the end flaps over the perforations or between the perforations and the articles being packaged.

The spaced articles and tubular packaging material which preferably has a thermosealing or thermoplastic sealing medium are first conveyed through a tucking station comprising a rotary tucker, which simultaneously tucks all four walls of the tube of wrapping material inwardly while applying heat and pressure to the material in a manner which partially seals the tucked end extensions together.

Downstream belts disposed between the tucking station and sealing station engage the packaging material and enclosed articles being packaged and serve to tension the tubular material in the tucking zone thereby assuring that distinct tuck lines in the wrapping material commence from each of the four adjacent corners of the article. The downstream belts are driven faster than the infeeding tubular material and grip the packaging material with sufficient force to tension the tube but also allow slippage to occur between the belts and the tube during the foreshortening of the space between articles resulting from the tucking operation. Side tubing belts grip the articles upstream of the tucking station with sufficient force to prevent slippage in response to the tensioning forces induced downstream. These upstream and downstream belts assure proper tensioning of the tubular wrapping material to enable achieving sharp tuck or crease lines extending from and along each of the four corners of each end of the packaged article.

The partially sealed or tacked extended ends are then moved through a sealing and cut-off station at which time the tucked and partially sealed wrapping material between the foremost article and the next adjacent article is fully crimped and sealed, and the foremost end package is transversely severed from the tube of material.

The use of the four side rotary tucker results in packages with reduced cut-off lengths which minimizes wrapping material costs while package appearance is improved because the crimped ends are well tucked and extended a minimum amount from the packaged article. This improved tucking method and apparatus is particularly useful in the packaging of relatively high articles where a good tuck is essential to prevent an excessive and unattractive flaring out of the extended ends.

It is one object of the present invention to provide a continuous motion four side rotary tucking device for a wrapping machine.

Another object is to provide a wrapping machine which uses a minimum of wrapping material while packaging spaced articles.

Another object is to provide a method and apparatus for simultaneously tucking all four sides of a tube of wrapping material at a single station between spaced articles being wrapped.

A further object is to provide an improved method of packaging articles while using a minimum of wrapping material.

Another object is to provide a single station rotary tucking device which assures that all four tucker surfaces travel with the web at essentially matched velocity throughout the tucking operation.

Another object is to provide a drive system which enables adjustment of velocity and timing so that the tucking apparatus does not limit the size range adjustability of the wrapping machine.

Another object is to provide means for partially sealing the tucked extended end in the tucking station so the tuck can be maintained during subsequent transfer to a station for final cross crimping, sealing and severing.

Another object is to provide alternative means for preventing excessive air pressure buildup within the tube during the tucking operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective of a wrapping machine incorporating the four side rotary tucker of the present invention.

FIG. 2 is a diagrammatic side elevation of the wrapping machine of FIG. 1.

FIG. 3 is a diagrammatic perspective of the four side rotary tucker, sealing and severing mechanism and the downstream tubing belt assembly; certain parts being cut away.

FIG. 4 is an enlarged side elevation of the tucking and sealing station with parts broken away and other parts shown in section.

FIG. 5 is an enlarged transverse section taken along lines 5—5 of FIG. 4 illustrating the four side rotary tucker in tucking position.

FIG. 6 is an enlarged side elevation illustrating the structure for mounting the rotary tucker for vertical adjustment enabling the unit to handle packages of different heights.

FIG. 7 is a vertical section taken along lines 7—7 of FIG. 5 illustrating a gear box for a side tucking unit.

FIG. 8 is an enlarged vertical section taken along lines 8—8 of FIG. 4 illustrating the sealing head assembly and certain drive parts for the rotary tucker and sealing head.

FIG. 9 is a plan of the input tubing belt assembly and a fragment of the downstream tubing belt assembly illustrating the structure for adjusting the input assembly for handling packages of different widths.

FIG. 10 is a section taken along lines 10—10 of FIG. 9.

FIG. 11 is a plan of a downstream or output tubing belt assembly.

FIG. 12 is a section taken along lines 12—12 of FIG. 11.

FIG. 13 is a left side elevation of the tucking and sealing stations illustrating metadiametric drives for the two stations.

FIG. 14 is a diagrammatic perspective of the drive for the wrapping machine.

FIG. 15 is a diagrammatic operational view in perspective illustrating the operation of the four side rotary tucker and sealing head assembly.

FIG. 16 is a diagrammatic side elevation illustrating the operation and desired timing of the rotary tucker and the sealing head assembly.

FIG. 17 is a diagrammatic plan view of FIG. 16.

FIG. 18 is a diagrammatic transverse section illustrating that the axes of rotation of the four tucking shoes are of equal radii and lie in a common transverse plane normal to the path of travel of the article.

FIG. 19 is an end view of a completed package.

FIG. 20 is a transverse section taken through an alternate embodiment illustrating a web perforating mechanism.

FIG. 21 is a longitudinal section taken along lines 21—21 of FIG. 20.

FIG. 22 is an enlarged perspective of a fragment of the perforating knife illustrating the shape of the web perforating teeth.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The four side rotary tucker 20 (FIGS. 2 and 3) of the present invention cooperates with the sealing head assembly 22 and an input side tubing belt assembly 23 and an output tubing belt assembly 23' of a wrapping machine 24 to seal articles A in packages P formed from a web W preferably of a thermosealing or thermoplastic wrapping material that is formed as a tube T (FIGS. 15–18) around the articles by the wrapping machine 24. The wrapping machine 24 is of the general type disclosed in assignee's U.S. Pat. No. 2,882,662 which issued to Campbell on Apr. 21, 1959 and which is incorporated by reference herein to illustrate web handling components and other features of the machine which are old in the art and are not fully disclosed herein.

In a manner conventional in the art, the articles A are placed at spaced intervals on an endless chain conveyor 26 and are driven by lugs 28 on the conveyor in the direction of the arrow 30 (FIGS. 1 and 2). The conveyor 26 moves the articles A through a web forming plough 32 which forms an endless tube T of web material around the spaced articles. The web W is drawn from a supply roll 34 by web feed rolls 35, is longitudinally sealed on its under surface by finwheels assembly 36, and is pulled through the tube forming plough 32 by driven input side belts 37 and 38 (FIG. 1) of the input belt assembly 23 disposed upstream of the rotary tucker 20. The input belts 37,38 grip the side walls of the tube T against the articles A with sufficient force to drive the articles while maintaining a desired spacing between articles as is well known in the art.

As best shown in FIGS. 3–5, the four side rotary tucker 20 is located at a tucking station TS and comprises rotary upper and lower tucker assemblies 40,42 and rotary side tucker assemblies 44,46. The upper and lower tucker assemblies 40,42 are carried by upper shaft 50 and lower shaft 52 which are journaled in upper bearing blocks 54 and lower bearing blocks 55, respectively, having cylindrical spacer blocks 56 disposed therebetween. The shafts 50,52 are interconnected by meshing gears 57,57' keyed thereto and being of equal size to drive the shafts at the same speed but in opposite direction. During tucking, air is withdrawn from the tube T by a flat vacuum tube 59 (FIGS. 15–17) which is connected to a suitable source of vacuum and extends from a position upstream of the tube of wrapping material T to a position adjacent the tucking station TS.

In order to accommodate batches of articles which may vary in vertical height, it is necessary to mount the shafts 50,52 for vertical adjustment to assure that the vertical midpoint of the articles A move along a horizontal path midway between the two shafts 50,52. In this regard, the bearing blocks 54,56 adjacent each end of the shafts are mounted in a vertical slide mechanism 58 (FIGS. 5 and 6) with the lower bearing or bearing block 55 being rigidly secured to the mechanism 58 and with the upper bearing or bearing block 54 being adjustable in the slide mechanism 58. A pair of studs 60 are secured to the upper bridge plate 62 of the slide mechanism 58 with nuts 64 thereon to adjust the downward pressure on the upper bearing blocks. Compression springs 66 are disposed between the upper bearing block 54 and the studs 60 to permit a limited amount of upward movement of the upper shaft 50 relative to the lower shaft 52. The slide mechanism 58 is slidably mounted in an upright slot 68 in the associated wall of the frame 70 of the wrapping machine 24. A bridge plate 72 covers each frame slot 68 and is apertured to slidably receive a capscrew 74 that is screwed into the bridge plate 62 of the slide mechanism 58 to lock the mechanism 58 in desired position by virtue of locknuts 76.

In the illustrated embodiment, the upper tucker assembly 40 (FIGS. 3,4 and 5) includes a radial upper tucking shoe 78 that is rigidly secured to the upper shaft 50 by capscrews 82. The tucking shoe 78 has a web engaging, deflecting and bonding foot 84 with an outer, arcuately curved central portion 86 and similarly arcuately curved, but recessed side portions 88.

Likewise, a radial lower tucking shoe 90 is rigidly secured to the lower shaft 52 by capscrews 94. The tucking shoe 90 includes a web engaging, deflecting and bonding foot 96 having an arcuately curved central portion 98 and similarly arcuately curved but recessed side portions 100.

The two tucking shoes 78 and 90 are diametrically opposed and are timed to lie in a common vertical plane containing the axes of both shafts 50,52 when the two shoes are tangent to horizontal planes and are tucking the web material together between two adjacent articles. The space between the web contacting surfaces of the central portions 86 and 98 of the upper and lower shoes when in the tucking position is approximately equal to four thicknesses of web material; for example, about 0.004 inches when the web material is one mil thick. The side portions of the upper and lower shoes are recessed to provide clearance for passage of the side tucker shoes.

In order to heat the upper and lower tucking shoes 78,90 to a bonding temperature, the shoes have heater cartridges 106 therein capable of raising the temperature of the web contacting surfaces of the shoes up to a bonding temperature. The cartridges are connected to slip rings (not shown) of an electrical power source by conductors that extend through bores in the shafts 50,52. Heating units of the above referred to type are conventional in sealing heads such as disclosed in the previously referred to Campbell U.S. Pat. No. 2,546,721 which patent is incorporated herein by reference.

Although only one tucker shoe has been illustrated on each shaft, it will be understood that it is desirable when packaging certain articles, such as short articles, to secure two diametrically opposed tucking shoes to each shaft 50,52.

Side tucker assemblies 44 and 46 are substantially the same and accordingly only the left side tucker assembly 44 (FIGS. 5 and 7) will be described in detail. Equivalent parts of the right tucker assembly 46 will be assigned the same numerals followed by the letter "*a*".

The left tucker assembly 44 includes a gear box 110 having bushings 112 that are journaled on the shaft 50. The gear box 110 is held from rotation and is adjusted longitudinally of the shaft 50 by an adjusting device 114. The device 114 includes an internally threaded rod 116 that is secured to the gear box 110 in one of a plurality of positions by set screws 117 and cooperating notches in the rod 116. One end of the rod is internally threaded to receive an externally threaded shouldered stud 118. The stud 118 includes an enlarged head 118' intermediate the ends thereof which abuts one side of an apertured bracket 119 bolted to the associated upper bearing block 54. A threaded portion of the stud 118 extends through the aperture in the bracket and has an adjusting nut 119' secured thereon. Thus, the gear box 110 may be adjusted longitudinally of the shaft 50 to vary the depth of side tuck by rotating the stud in either direction.

A helical drive gear 120 in the gear box 110 is connected to the shaft 50 by a high center key 122 in a keyway in the shaft for rotation with the shaft and axial movement relative thereto. The drive gear meshes with a driven helical gear 124 (FIG. 7) secured to a shaft 126 journaled in the gear box 110. A spur gear 128 rigid with the shaft 126 meshes with a gear 130 secured to an output shaft 132 that is journaled in the gear box 110 and projecting vertically downward. The top of the gear 130 is relieved to permit clearance for the helical drive gear 120.

A left side tucking shoe 134 is connected to a split block hub 136 which is rigidly secured to the output shaft 132 by a capscrew and a cooperating split block collar 140. The outer web engaging peripheral edge of the side tucking shoes 134,134*a* is formed as an arc having a radius equal to the length of the tucking shoes 134,134*a*, which radius is also equal to the radius of the outer periphery of the upper tucking shoe 78 and lower tucking shoe 90.

Although only one side tucking shoe has been illustrated, it will be understood that the number of side tucking shoes used will correspond to the number of shoes used on the shafts 50 and 52.

As best illustrated in FIGS. 3 and 5 the cooperating sets of tucker shoes 78,90,134 and 134*a* are all rotated about their axes 50',52',132',132*a*' (FIG. 18) at the same speed and all shoes while in contact with the web simultaneously pass through their respective axial planes of symmetry, which plane is normal to the article path and containing the axes of the shafts 50,52,132 and 132*a*. At this time, the four tucking shoes in engagement with the web are traveling in the same direction and at approximately the same linear speed as the web at the point of contact, which speed will be slightly slower than the speed of the articles A upstream of the four-side rotary tucker 20. It will also be noted that at this time the outer end portions of the side tucker shoes 134,134*a* lie within the space between the associated recessed side portions 88 and 100 of the upper and lower shoes 78 and 90.

As best illustrated in FIGS. 3, 4 and 8, the heat sealing and film severing head 22 is disposed at a sealing station SS downstream of the rotary tucker 20 and includes an upper shaft 150 and a lower shaft 152 journaled in bearing blocks 154 and 156, respectively, which bearing blocks are mounted on the frame 70 in a manner similar to the bearings blocks of the tucker. The shafts 150,152 are driven at the same speed and in opposite directions by meshing gears 158 and 160.

The upper shaft 150 carries a slotted crimper bar or shoe 162 which supports a knife 164 and an electrical heating cartridge 166 that is connected to a well known brush and slip ring assembly by conductors extending through a bore in the shaft 150. Similarly, a slotted anvil or shoe 170 is secured to the lower shaft 152 and has an electrical heating cartridge 171 therein that communicates with a brush and slip ring assembly by means of internal conductors. A knurled semi-cylindrical article support 174 is bolted to the lower shaft 152 and serves to support the articles entering the cutting and sealing station SS.

Since the tucking operation causes the film and space between the articles to foreshorten in the area between the tucking station and the sealing and severing station, it has been determined that the optimum timing is such that the tucker should complete the tucking operation before the heat sealing and film severing head contacts the film. Thus, the timing of the rotary tucker 20 relative to the heat sealing head has been illustrated as being 180° out of phase in FIG. 4. If the longitudinal distance between the two heads is maintained constant, it will, of course, be understood that the timing of the heat sealing

head relative to the tucking head may be changed so as to accommodate articles of different lengths.

As mentioned previously, it is desirable to apply a tension on the film tubing T and to evacuate air from the tube during the tucking operation in order to form firm tuck lines in the wrapping material from each of the four corners of the two adjacent articles.

For this purpose, the previously mentioned input side tubing belt assembly **23** (FIGS. **9** and **10**) is disposed upstream of the rotary tucker **20** and the output side tucking belt assembly **23'** is located between the rotary tucker **20** and the sealing assembly **22**. The upstream side tubing belt assembly **23** includes the previously mentioned pair of endless belts **37** and **38**. Since the parts associated with each belt are substantially the same, only the parts associated with the right belt **37** will be described in detail and equivalent parts associated with the left belt will be given the same numerals followed by the letter "*a*".

The belt **37** is trained around a drive roller **184**, and an idler roller **186**. The drive roller **184** is secured to a vertical shaft **188** journaled in a gear box **190** slidably received in a trackway **192** of the frame **70**. A drive shaft **196** journaled on the frame **70** extends through both gear boxes **190,190***a* and is connected in driving engagement with the associated vertical shaft **188** by a right angle gear train **197**. An elongated keyway in the driveshaft **196** and cooperating keys **198** allows the shaft to slide transversely within the gear boxes **190,190***a* while maintaining driving engagement with the shaft **188** for the drive roller **184** and the shaft (not shown) for the drive roller **184***a*. The drive shaft **196** is connected by a chain drive **200** to a shaft **202** that is journaled in the frame and is driven by means to be described hereinafter.

The two gear boxes **190,190***a* may be moved toward or away from each other to adjust engagement pressure between the side belts and the wrapping material and to accommodate articles of different widths, by a rod **204** journaled in the frame **70** and having right and left hand screw threads on opposite ends thereof. The threaded portions of the rod are received in complementary threaded portions of the two gear boxes. The rod **204** is manually rotated as required by a hand wheel **205** that is journaled on the frame and is connected to the rod **204** by a chain drive **206**.

The idler roller **186** is journaled on a vertical shaft **208** secured to a longitudinally adjustable belt take-up slide **210** of an associated transversely adjustable carriage **212**. The carriage **212,212***a* are adjusted transversely by manually turning a hand wheel **214** coupled to a rod **216** journaled in the frame **70** and having right and left hand screw threads received in similarly threaded portions of the associated carriage **212,212***a*. Tie bars **220,220***a* connect each carriage **212,212***a* to the associated aligned gear box **190,190***a*. Each tie bar has a vertical fin **222,222***a* secured thereto for supporting one end of each of a plurality of leaf springs **224,224***a*. The other ends of the springs are secured to a belt guide bar or upper shaft rider **226,226***a* which resiliently urges the belts against the packaging material and articles therein. A film and article supporting slide bar or lower shaft rider **228** is mounted midway between the belts **37,38** for supporting the articles as they are advanced toward the discharge end of the packaging machine.

The previously described side tubing belt assembly **23** is one arrangement for transporting the entubed articles into the tucking station. Other conveying arrangements such as top and bottom tubing belts or multiple pairs of fin wheels might be substituted for the side belts when transporting certain articles.

The side tubing belt assembly **23'** is disposed between the rotary tucker **20** (FIG. **4**) and the sealing assembly **22** and includes endless belts **240** and **240***a* (FIGS. **11** and **12**). Since the parts associated with the belts **240** and **240***a* are substantially the same, only the right assembly will be described in detail and the left assembly will be assigned the same numerals followed by the letter "*a*".

The belt **240**, as shown in FIG. **12**, is trained around a drive roller **242**, an idler roller **244**, and a take-up roller **246** all of which are supported on a transversely adjustable carriage **248**. The drive roller **242** is journaled on a dead shaft **250** and includes a tubular neck **251** secured to a gear **252** that meshes with a gear **254** secured, as by a sliding key **255**, for rotation with, but adjustment axially of the shaft **256**. The shaft **256** is journaled in the frame **70** and in the carriage **248** and is driven from the shaft **196** (FIG. **9**) by a chain drive **258**.

In order to adjust the belts **240** and **240***a* transversely, a transversely extending adjusting rod **260** is journaled on the frame and includes right and left hand threaded portions engaging complementary threaded portions in the carriages **248** and **248***a*. The carriages are slidably received in a trackway **261** of the frame **70**. The rod **260** is manually rotated from a remote location by a hand wheel **263** (FIGS. **4** and **11**) and sprocket **264** that are secured to a shaft **265** journaled in the frame **70**. A first chain drive **266** connects the sprocket **264** to the double sprocket **268** journaled on a stub shaft **270**. The double sprocket **268** is connected to a sprocket **271** on the adjusting rod **260** by a chain **272**.

The previously described side tubing belt assembly **23'** is one arrangement for transporting the entubed articles between the tucking station and the cross sealing station. Other conveying arrangements such as top and bottom tubing belts or chains may be desirable for certain types of articles.

An article supporting plate **274** is mounted on the frame **70** between the belts **240,240***a* to support the packaged articles after the tucking operation has been performed on the tube T. After passing through the sealing station SS, the articles move onto any suitable type of delivery conveyor **276** (FIG. **4**) for delivering the articles from the machine. One such conveyor includes an endless belt **278** with its upper run positioned at substantially the same level as the plate **274**. The belt **278** is trained around a drive pulley **280** secured to a shaft **282** journaled on the frame **70**, a driven pulley **284** secured to a shaft **286** journaled on the frame, and a take-up pulley **288** journaled on the shaft **290** secured to the free end of a take-up arm **292** that is clamped in adjusted position on a shaft **294** that is secured to the frame. The delivery conveyor **276** is driven from an intermediate shaft **296** of the heat sealing and severing head **22** by a chain drive **298** connected between the shaft **296** and a stub shaft **299**; and a gear drive **300** (FIG. **14**) connected between the shaft **299** and the shaft **282**. Power is directed to the shaft **296** by drive means to be described hereinafter.

Whereas the upstream tubing belts **37,38** (FIG. **9**) are adjusted to firmly grip the tube and articles therein, it will be understood that the downstream tubing belts **240,240***a* are adjusted to provide a light pressure for keeping the tube taut as the tucker blades engage and tuck the film inwardly. The light pressure between the

belts and film is sufficient to provide firm or distinct tuck lines, yet will allow slippage between the film and the belts 240,240*a* to allow for the foreshortening of the film tube during the tucking operation.

Normally, the tubing belts 240,240*a* are driven at a slightly faster speed than the speed of the upstream belts 37,38 thereby providing the desired tension and separating the entubed product to the maximum spacing allowed by the tucked wrapping material, which material is partially sealed together at the tucking station as previously mentioned. This separation of the products to their maximum spacing after the tucking operation has been performed, provides maximum spacing between articles for easier entry of the sealing and cutting heads 162,170 (FIG. 4) at the sealing station SS.

However, when packaging products having a transverse cross-section that is approximately square and which is difficult to tack or hold in the tucked position at the tucking station, the belts 240,240*a* may be driven slightly slower than the belts 37,38 to prevent unfolding of the tucked material. In such cases, sufficient tension is maintained on the tubing T during tucking since the downstream article moves toward the upstream article by virtue of the pulling forces applied to the article during the process of tucking the tubular film inwardly. If additional tension is required, a resilient surfaced upper shaft rider (not shown but similar to the riders 226,226*a* of FIG. 9) may be placed above the film between the tucking and sealing station to frictionally grip the film and article therein between the lower shaft rider 228 and the resilient upper shaft rider. Such frictional engagement resists rearward movement of the foremost article during tucking thus tensioning the film during the tucking operation. It will be understood that the speed changes between the two side tubing belt assemblies may be provided by drive ratio adjustment means or by merely selecting the proper sprocket sizes.

A drive mechanism 310 (FIG. 14) is provided for controlling the operation of the several components of the wrapping machine 24. Although the details of most of the components of the drive mechanism are well known in the art, the general arrangement of the several components will be described in order to better define the overall operation of the machine and to point out the manner in which the several components may be adjusted relative to each other.

The drive mechanism 310 includes a main drive motor 312 that is coupled to a first right angle gear box 314 by a belt drive 316. An output shaft 318 of the gear box 314 is coupled to a second gear box 320 having one of its output shafts connected by a drive shaft 322 to a third right angle gear box 324. The output shaft of the third gear box 324 is connected by input gears 326,328 and 330 to the input shaft 332 of a differential assembly 334. A chain drive 336 connects the shaft 332 of the differential assembly to the rotatable planetary gear housing assembly 338 of a planetary drive assembly 340. A rotatable ring gear housing 339 of the planetary drive assembly 340 is connected by a chain drive 344 to a 1:1 shaft 345 which makes one revolution for each article moving through the machine. The shaft 345 is connected to and drives the input shaft 26*a* (FIG. 2) of the article receiving or feed conveyor 26 by a chain drive 346 to drive conveyor 26 in the direction indicated by the arrow 30 in FIG. 2. In order to time the lugs 28 of the conveyor 26 with other components of the wrapping machine 24, a sun gear (not shown) of the planetary drive assembly 340 is connected to a shaft 348 that is rotated relative to the planetary gear housing 338 and the ring gear housing 339. The sun gear shaft 348 rotatably supports the planetary gear housing 338 and the ring gear housing 339, and is rotated relative to both housings by a crank 350 and gear train 352. The crank 350 and sun gear (not shown) are held in desired stationary position during operation of the machine by a detent on the crank and a cooperating aperture of an apertured locking plate 354.

The differential assembly 334 is of a well known adjustable type wherein the input shaft 332 drive an output shaft 360 through gears secured to each shaft and connected in driving engagement with each other by meshing gears carried by a rotatable ring gear. In order to vary the speed of the output shaft 360 relative to the input shaft 332, a correction motor 370 is connected to a speed control shaft 372 by a chain drive 374. The speed control shaft has a pinion (not shown) keyed thereon which meshes with the aforementioned rotatable ring gear. The correction motor serves to vary the output speed of the output shaft 360 for the purpose of controlling the speed of the several components acting on the film upstream of the rotary tucker 20.

The correction motor 370 is controlled by a selector switch 376 (Candy switch) which cooperates with an electric eye assembly (not shown) for the purpose of detecting printed matter or the like on the film and registering the printed matter in the desired timing relationship to the conveyor lugs 28. These described components are commonly employed in print register control systems well known in the packaging art.

A gear 380 on the output shaft 360 of the differential assembly 334 drives an input gear 382 of a positively independently variable speed drive assembly 384. The drive assembly 384 is capable of providing speed changes up to about a 6 to 1 ratio by manually rotating a hand wheel 386 and control shaft 388 as required.

A first chain drive 390 is connected between the output shaft 392 of the variable speed drive assembly 384 and a shaft 394. The shaft 394 is connected to the web feed rolls 35 (FIG. 2) by a chain drive 396 thus permitting adjustment to feed in the proper amount of web for each wrapping cycle.

A second chain drive 400 connects the output shaft 392 to an idler shaft 402 which is, in turn, connected to the lower cone shaft 404 of a first adjustable cone pulley drive assembly 406, by a chain drive 408. The usual axially adjustable cone pulley drive belt 410 connects the lower cone 412 to the upper cone 414 which drives the fin wheel sealer 36 (FIG. 2) by a chain drive 416. A chain drive 418 connects the lower cone shaft 404 to the lower cone shaft 419 of a second adjustable cone pulley drive assembly 420 having its upper cone shaft 422 connected to the shaft 202 (FIG. 9) of the side tubing belt assembly 23 by a chain drive 424. As previously mentioned, the shaft 196 of the upstream tubing belt assembly 23 is connected to the shaft 256 of the downstream tubing belt assembly 23' by chain drive 258. Thus, the film drive components are all controlled by the differential assembly 334 and the variable speed drive assembly 384. The two described cone pulley assemblies 406 and 420 provide means to trim the velocities of the finwheel 36 and the outer surfaces of tubing belts assemblies 23 and 23' to achieve optimum tube tensioning control.

The rotary tucker 20 sealing head assembly 22, and delivery conveyor 276 (FIG. 4) receive their power from a second output shaft 430 of the gear box 320. The

second output shaft 430 is connected to an intermediate shaft 432 (FIGS. 8,13 and 14) by a chain drive 434. The intermediate shaft 432 is connected to a timing shaft 436 by a gear drive 438 which timing shaft has a hand wheel 440 secured thereto for the purpose of manually operating the drive train to facilitate set up adjustments. The shaft 432 is also connected to a first metadiametric drive shaft 442 by a chain drive 444, which shaft also has a metadiametric driver 446 keyed thereto. The shaft 442 is driven one revolution for each package passing through the machine. It will also be noted that the cam shaft of the selector switch 376 is driven one revolution for each revolution of the shaft 442 by chain drives 447,448 and 449 (FIG. 14).

The metadiametric driver 446 is part of a first metadiametric drive 450 which is fully disclosed in my British Pat. No. 1,362,060 which issued on November 27, 1974 and is incorporated by reference herein.

The function of the metadiametric drive 450 (FIG. 13) is to rotate the rotary crimper 20 one revolution for each package passing through the wrapping machine, but to vary the peripheral speed of the tucking heads 78,90,134,134*a* (FIG. 3), during each revolution so that their average linear speed is substantially the same as that of the wrapping material during tucking. It will, of course, be understood that if two tucking heads are mounted on each shaft 50,52, that the metadiametric drive 450 will be geared to drive the shafts 50,52 one half revolution for each article moving through the machine.

Briefly, the metadiametric drive 450 (FIGS. 8–13) includes the driver 446 which includes a slot 454 that receives a cam follower 456 journaled on a gear 458. The gear 458 is rigid with a shaft 459 journaled in an adjustment bracket 460 (FIG. 13) that is pivoted about a stub shaft 462 and is adjusted through an arcuate range by an adjustment device 464. The adjustment device 464 includes a threaded shaft 466 screwed transversely into a stub shaft 468 pivoted to the bracket 460; a pair of universal joints 468 and cooperating connecting shaft 470, and an adjustment shaft 472 having a control knob 474 thereon. Rotation of the control knob thus pivotally adjusts the bracket 460 and gear 458, and the bracket is then locked in desired position by a threaded locking clamp 476 that extends through an arcuate slot 477 in the bracket. This adjustment in effect changes the amount of offset between the input shaft 442 and output shaft 459 centers and thereby adjusts the amount of cyclical speed variation to suit the wrapping application. The gear 458 meshes with a gear 478 that is journaled on the stub shaft 462. The gear 478 meshes with a drive gear 486 pivoted on a stub shaft 488. The drive gear 486 meshes with a gear 490 on the lower shaft 52 of the rotary tucker 20. Since the elevation of the lower shaft 52 must be adjusted to accommodate articles of different thicknesses, the gear 486 is journaled on stub shaft 488 which is secured to a bracket 492 pivoted about the shaft 462 and locked to the frame 70 in adjusted position by screws 494 extended through slots 496 in the bracket 492.

As illustrated in FIGS. 4 and 14, the chain drive 447 connects the metadiametric drive shaft 442 of the first metadiametric drive 450 to the previously mentioned second metadiametric drive shaft 296 of a second metadiametric drive 504 that drives a gear 506 (FIG. 13) on the lower shaft 152 of a sealing head assembly 22. The second metadiametric drive 504 is substantially the same as the first metadiametric drive 450 and accordingly will not be described in detail. It should be mentioned however that the second metadiametric drive 504 is controlled independently of the first drive by a knob 508 and threaded adjustment rod 510 as clearly illustrated in FIG. 13.

As previously mentioned, the delivery conveyor 276 (FIG. 4) is driven from the second metadiametric drive shaft 296 by the chain drive 298.

Although the operation of the wrapping machine 24 has been described in conjunction with the description of the several components of the wrapping machine, a summary of the operation will follow.

Prior to feeding articles A of a particular size and shape onto the article receiving conveyor 26, (FIG. 2) the several components of the wrapping machine 24 are first mechanically adjusted to handle these particular articles. In this regard, the vertical height of the rotary tucker 20 (FIG. 4) and the sealing head assembly 22 are adjusted to assure that the articles are vertically centered relative to the upper and lower tucking shoes 78,90 and sealing shoes 162,170. The sealing shoes 162,170 are angularly timed relative to the tucking shoes 78,90 so that both sets of shoes engage the portion of the web between the articles at the appropriate time depending upon the length of the articles. As mentioned previously, it is desirable that the tucking shoes complete their tucking operation between a pair of upstream articles prior to the engagement of the sealing shoes with the tucked material between a pair of downstream articles. The required initial angular setting may be accomplished by advancing or retarding one of the sprockets in the chain drive 447 relative to the other sprocket. With the speed of the adjustable speed motor 312 (FIG. 14) determined to provide the desired speed of articles through the machine, the hand wheel 386 of the variable speed drive 384 and the two adjustable cone drives 406 and 420 are adjusted to drive the packaging material at the correct speed. The timing of the lugs 28 of the article receiving conveyor 26 is advanced or retarded to the proper condition by operating the crank 350 which adjusts the planetary drive assembly 340 as required. Although the conveyor 26 with lugs 28 spaced a predetermined distance apart may be driven slightly slower or faster than the packaging material to accommodate batches of articles that differ slightly in length; if large differences in article lengths are present, it is preferable that a new conveyor with appropriately spaced lugs be substituted for the original conveyor. If printed wrapping material is used, the timing of selector switch 376 is first adjusted to locate the printed material relative to the conveyor lugs 28. After operation is commenced, a photoelectric scanner (not shown) and the selector switch 376 serve to actuate the correction motor 370 which advances or retracts the differential assembly to maintain the film properly registered with the conveyor lugs 28.

Having reference to FIGS. 15–19, the spaced articles A within the tube T of wrapping material first enters the tucking station TS at which time the vacuum tube 59 is evacuating air from between the articles A. The heated upper and lower tucking shoes 78,90 and the side tucker shoes 134,134*a* simultaneously enter the space between the two adjacent articles A1 and A2 to tuck the four sides of the packaging material inwardly and to partially heat seal or tack the upper and lower panels together at least at the transverse central portion of the tucked material. During this time, the upstream tubing belts 37,38 (FIG. 9) firmly grip the upstream article A1 and

the downstream belts 240,240*a* engage the article A2 with sufficient force to tension the film to form distinct tuck lines from all adjacent corners of the articles but with insufficient force to preclude slippage of the article A2 and surrounding wrapping material relative to the downstream tubing belts 240,240*a*. As the four panels of the packaging material are tucked inwardly, the downstream article A2 (FIGS. 15–17) is pulled towards the upstream article A1 reducing the space between the articles A1 and A2. Although this reduction of article spacing occurs only at the tucking station TS, the downstream articles such as A3,A4 that remain attached to the tube T of wrapping material do experience variations of velocity as the upstream tucking operation takes place. Subsequent to the tucking operation, the heated sealing and severing bars 162 and 170 engage and seal the tucked material between articles A3 and A4 at the sealing station SS while at the same time the knife 164 severs the downstream package containing article A4 from the tube T providing a finished package as illustrated in FIG. 19. It will of course be understood that the severing knife 164 may be removed from the sealing bar 162 if it is desired to have the separately packaged articles connected to one another. Likewise a perforating device could be employed to produce perforated connections between packaged articles if desired.

It is recognized that when packaging certain stacked, slippery articles such as individually wrapped cheese slices or the like, the stack alignment may be disturbed by frictional drag forces between the top of the stack and the stationary vacuum tube 59. Accordingly, in such installations the air evacuating tube 59 may be replaced by a web perforating mechanism 520 as an alternate air evacuating system and as illustrated in FIGS. 20,21 and 22.

In accordance with the second embodiment of the invention the web perforating mechanism 520 is mounted upstream of the forming plow 32 (FIG. 2) by structure similar to that used at the tucking station. The mechanism 520 includes an upper shaft 522 and a lower shaft 523 with the upper shaft either driven directly from the 1 to 1 shaft 345 (FIGS. 2 and 14) by a chain drive 524 and reverse gears (not shown) if the perforating knife 526 is properly sized; but preferably through a third independently controlled metadiametric drive similar to the drive 450, which third drive is also driven from the shaft 345. The lower shaft 523 is driven from the web feed roll drive shaft 394 by a chain drive 528.

The web perforating mechanism 520 includes the upper shaft 522 (FIGS. 20 and 21) having a radially extending perforating knife 526 secured thereto and terminating in a plurality of sharpened V-shaped cutters 526*a* (FIG. 22) projecting downwardly therefrom and arranged to perforate the web disposed between the knife 526 and a hardened steel sleeve 527 on the lower shaft 523 at a point which will lie substantially midway between the two adjacent articles after the web of wrapping material advances downstream through the tucking station TS. Thus the wrapping material is perforated upstream of the forming plow 32 before being folded. The knife 526 severs and thus forms perforations in the web of wrapping material but the severed portions of the web remain attached to the web so that web slugs do not contaminate the articles. As indicated in FIG. 21, the web of wrapping material W is guided through the perforating mechanism 520 when in its unfolded condition by idler rollers 530 and 532. The rollers are journaled on arms 534 secured to the frame 70.

Thus, during tucking operation at the tucking station TS, air within the tube T between adjacent articles flows out of the perforations in the web due to the increased pressure resulting from inwardly folding the package ends. As the tucked area enters the sealing station SS, the sealing bars 162,170 heat seal the area of the film which includes the air bleed perforations thus closing the perforations and providing air tight packages.

From the foregoing description it will be apparent that the article wrapping machine of the present invention includes a rotary tucker which includes a pair of rotary transverse tucking shoes and a pair of side tucking shoes that simultaneously tuck all four side walls of the wrapping material inwardly at a single station. If the wrapping material is a thermosealing material, certain of the tucking shoes are heated to partially seal the tucked end extensions together. During the tucking operation the tube of wrapping material is tensioned between upstream and downstream tubing belt assemblies with the upstream assembly firmly gripping the wrapping material and articles therein, and with the downstream assembly gripping the material with sufficient force to tension the wrapping material while allowing the wrapping material and article to slide rearwardly relative thereto since the tucking operation reduces the distance between articles. The rotary tucker operates in combination with a rotary sealing head assembly which seals the ends of the packages together and severs the packages from the tube. An adjustable drive mechanism is provided for controlling the speed of the tucking and sealing mechanisms relative to the web and article speed, and is capable of being readily adjustable to handle products of different lengths. Means are also provided to evacuate air from the tube of wrapping material.

Although the best mode contemplated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention.

I claim:

1. In the method of packaging articles by continuously forming a strip of flat heat sealable material into a tube in which equally longitudinally spaced articles are inserted and transported by the tube, the tube defining top, bottom and side walls whose unoccupied longitudinally spaced portions are deflected toward the central axis of the tube by tucking members; the improvement in said method comprising the steps of simultaneously creasing the side walls of the tube inwardly at unoccupied portions of the tube substantially at the midplane of the tube, said creasing step leaving the creased side walls of the tube spaced by a minimum spacing at a single transverse zone, substantially concurrently deflecting the top and bottom walls of the tube into engagement at said zone along a single, narrow transverse central area that is slightly shorter than the minimum spacing between the creased side walls of the tube, bonding said top and bottom walls together along said single, narrow transverse central area when said upper and lower walls are deflected into engagement, applying longitudinally moving, frictional web feeding forces before, during and after said creasing steps to transversely opposed sides of the web side walls and the articles therein both upstream and downstream of said

single bonding area with said web feeding frictional forces moving at differential speeds, the tube shortening action of said creasing and bonding steps being resisted by said frictional web feeding forces for rendering the creased portions of said tube taut at both sides of said bonded area during the creasing step, said web feeding frictional forces downstream of said bonding area accommodating longitudinal movement of the downstream article toward the upstream article during said creasing step, feeding the creased and bonded area to a position downstream of the position at which the creasing and bonding steps were performed, and transversely bonding and severing the entire width of the tube through the creased and previously bonded area between articles that have been fed to said downstream position.

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United States Patent [19]

Tagliaferri et al.

[11] Patent Number: 5,481,848

[45] Date of Patent: Jan. 9, 1996

[54] **METHOD FOR FEEDING AND PREPARING INFORMATION LEAFLETS ON A PRODUCT PACKAGING LINE AND A SYSTEM FOR IMPLEMENTING THIS METHOD**

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[73] Assignee: **I.M.A. Industria Macchine Automatiche S.P.A.**, Ozzano Emilia, Italy

[21] Appl. No.: **121,287**

[22] Filed: **Sep. 14, 1993**

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[6] **B65B 35/54**

[52] **U.S. Cl.** **53/157**; 53/238; 53/252

[58] **Field of Search** 271/204, 206, 271/277; 53/117, 238, 157, 445, 378.3, 387.2, 252

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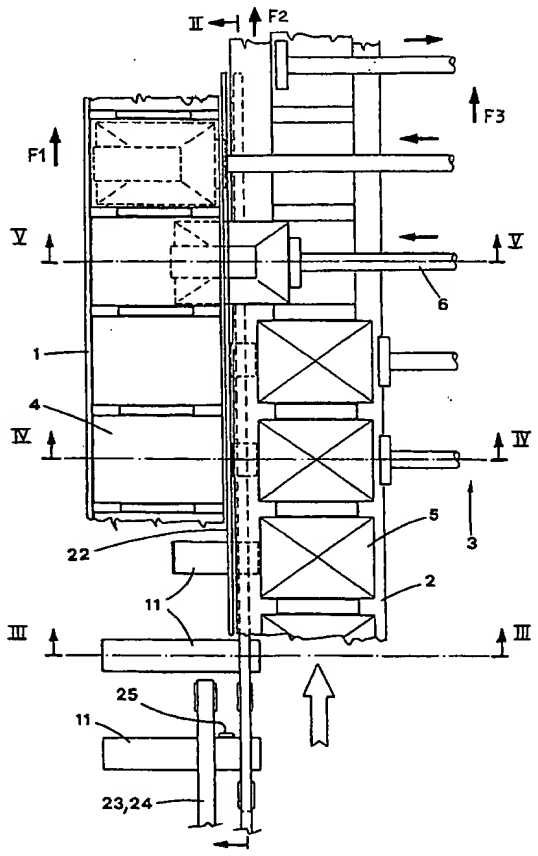
Assistant Examiner—Gene L. Kim
Attorney, Agent, or Firm—McAulay Fisher Nissen Goldberg & Kiel

[57] **ABSTRACT**

A method for feeding and preparing information leaflets on a product packaging line consisting of a first carton conveyor, a second product conveyor and, between these two conveyors, a leaflet continuous-grip conveyor for transporting leaflets along a conveyor aligned to the packaging lines where the leaflet conveying means have sections with varying degrees of grip to facilitate feeding and inserting of leaflets.

7 Claims, 3 Drawing Sheets



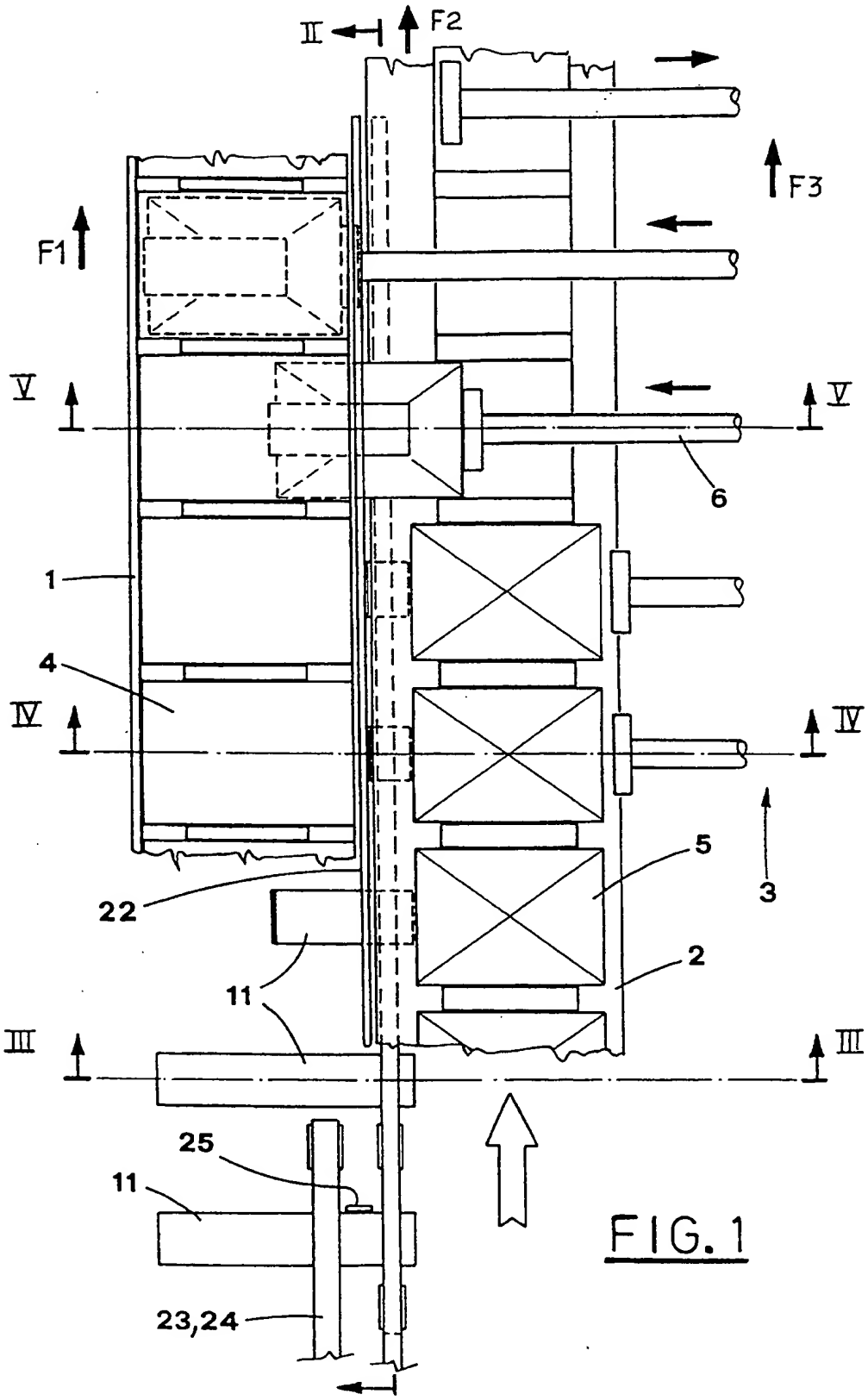


FIG. 1

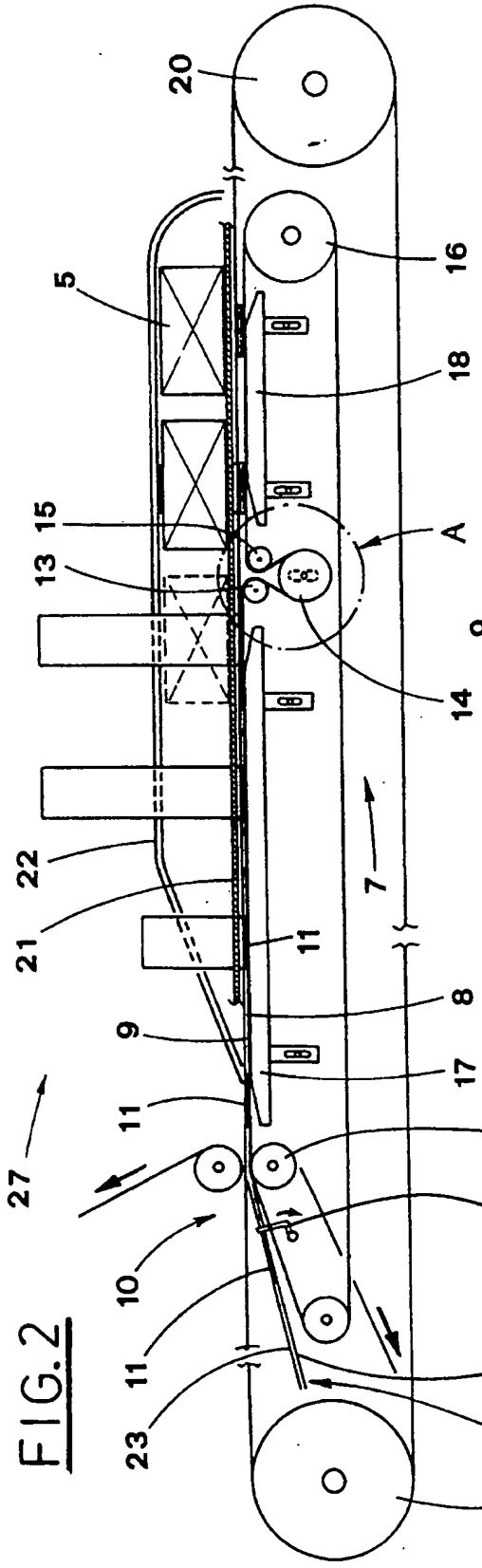

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FIG. 2

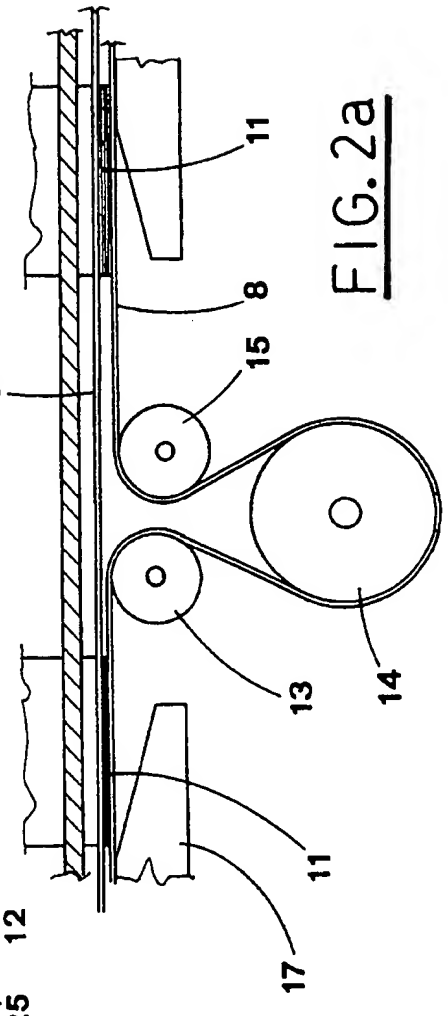
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FIG. 2a

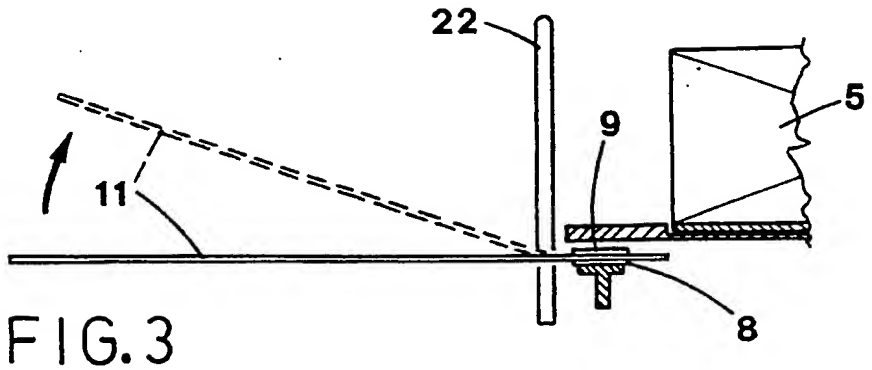

FIG. 3

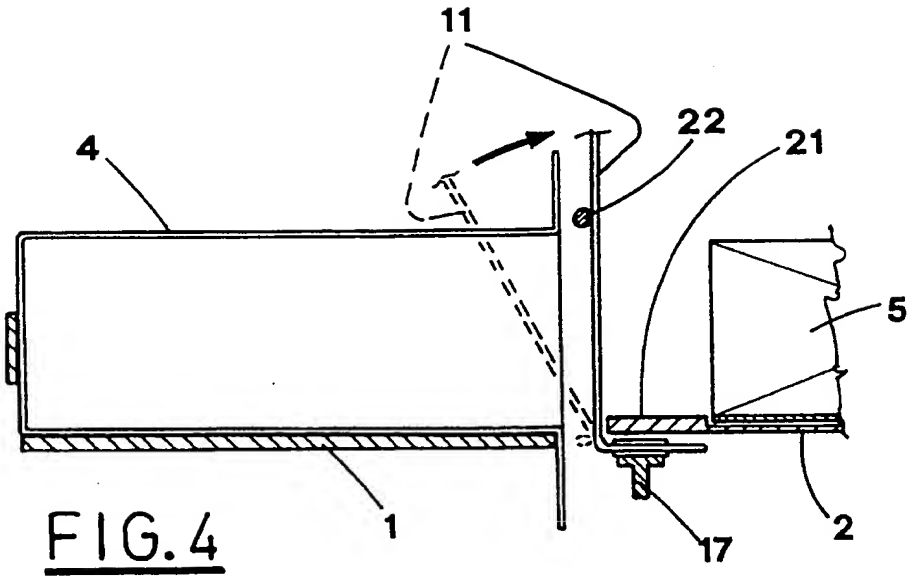

FIG. 4

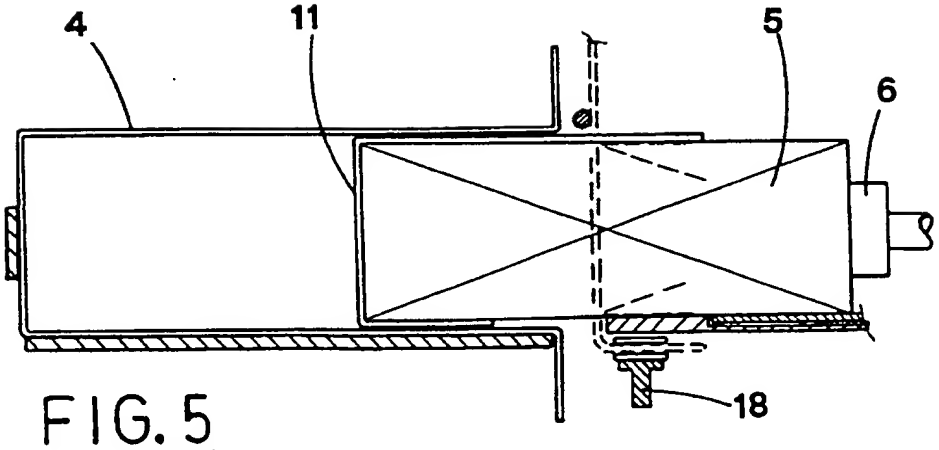

FIG. 5

METHOD FOR FEEDING AND PREPARING INFORMATION LEAFLETS ON A PRODUCT PACKAGING LINE AND A SYSTEM FOR IMPLEMENTING THIS METHOD

BACKGROUND OF THE INVENTION

This invention consists of a method for feeding and preparing information leaflets along a product packaging line and a system for implementing this method.

DESCRIPTION OF THE PRIOR ART

In the current state of the art, automatic, continuous-movement packaging machines for packing products into cartons consist of three, closed-loop conveyors, positioned side by side, longitudinally parallel to each other and whose top surfaces are approximately coplanar. The first of these conveyors usually has guide elements for positioning pre-formed, opened cartons on the conveyor and for transporting the cartons along the packaging line so that at least the carton faces immediately adjacent to the second conveyor are open. Running alongside the first conveyor there is a second conveyor, usually of the bucket type, designed to transport single product items at an equal distance from each other and aligned with the cartons carried on the first conveyor running alongside. Alongside the second conveyor there is a third conveyor with pusher elements designed to operate across the upper plane of the packaging line and designed to push the products on the second conveyor into their respective cartons carried on the first conveyor. The cartons, products and pushers are driven and fed at the same speed longitudinally aligned along the same plane. If, in the machine configuration described above, an information leaflet (for example, describing product characteristics) is to be inserted into the carton, a fourth conveyor is positioned between the first carton conveyor and the second bucket conveyor and is equipped with gripping means which are usually of the flexible, sprung type. These sprung grippers are moved along the packaging line by the fourth conveyor and are held in position during their travel close to the outfeed of each bucket on the second conveyor; the grippers can, for example, be positioned at the bottom centre of the lower edge of the buckets so that they do not interfere with the products as these are pushed into their cartons. The grippers are opened and closed by fixed guide means positioned along the packaging line which perform the following sequence of operations. At the beginning of the packing line the grippers are open in preparation for picking up the leaflet. When the grippers reach the leaflet pick-up station, the fixed guides close the grippers so that the leaflet is gripped between the gripper prongs in a position which is usually vertical and central to the lower edge of the respective bucket. The leaflet gripped in this way is carried along the packaging line to the product cartoning station where pushers eject the product from its bucket; as the product is ejected from its bucket it meets the leaflet and carries it into the carton without interfering with the grippers. In this the product insertion phase the fixed guides open the gripper prongs to allow the leaflet to be inserted into the carton with the product. This method for inserting leaflets into cartons has several drawbacks. The first drawback is that the actuation of the gripper prongs during the leaflet pick-up phase at the leaflet pick-up station must take place in a very short time. This means that the fixed guides require very precise adjustment. Sometimes, even when the maximum of care is taken, the leaflet is not picked up or is picked up incorrectly

thus leading to faults in subsequent phases. A second drawback occurs in the product insertion phase at the product cartoning station where the grippers must open exactly at the moment when the leaflet reaches the carton infeed; if the grippers are opened before this point is reached, the leaflet will drop down and be lost; if the grippers are opened after this point is reached, the leaflet will be torn by the action of the product being inserted into the carton while the leaflet is still gripped by the gripper. A further drawback of the method described above stems from the fact that the leaflet is held in an upright position between the gripper prongs and that during the product cartoning phase the leaflet must be folded into a U-shape as it is pushed into the carton. This folding action requires considerable pusher power. A faulty fold can cause jamming and an uneven fold can lead to irregular movements of the pushers and related products thus causing unwanted decelerations and accelerations in operating speeds. Yet another drawback to the above method occurs during size-changeover operations where a change in the size of the product conveyor also requires a re-adjustment of the grippers along the packing line or a complete change of all leaflet grippers to match the new size. Other shortcomings of the above method include: the noise caused as the leaflet grippers hit the fixed guides during opening and closing operations; rapid gripper wear; complicated gripper mechanisms.

SUMMARY OF THE INVENTION

The aim of the present invention is therefore to solve the shortcomings listed above by providing a method for feeding and preparing information leaflets along a product packaging line consisting of a first carton conveyor and a second product conveyor. The method is characterised by the fact that between the first carton conveyor and the second product conveyor there are means for continuously gripping and transporting leaflets designed to receive sequentially fed leaflets and convey them along a leaflet conveyor line which is aligned to the packaging line so that the leaflets are positioned in the middle between the first and second conveyors in alignment with the cartons and products; the means for conveying the leaflets along the line have a first section providing a strong grip for picking up and preparing the leaflets and a second section providing a weaker grip for inserting leaflets into cartons. The said means pre-fold the leaflets and hold them in position along the leaflet conveyor line in readiness for insertion into their respective cartons. A further aim of the present invention is to provide a system for feeding and preparing leaflets along a product packaging line consisting of a first carton conveyor and a second product conveyor where the system is characterised by the fact that it has, between the first carton conveyor and the second product conveyor, leaflet continuous-grip conveyor means consisting of two belts, one above the other, touching and longitudinally aligned; the leaflet is gripped and transported between and by the two belts forming the leaflet conveyor line aligned to the packaging line. The leaflet conveying means consist of a pair of coplanar, closed-loop belts whose inside surfaces touch along a section so as to define a leaflet conveyor line. The adherence between the belts of the leaflet conveyor line can be varied by adjusting sliding plates fitted to the belts and/or by adjusting guide pulleys. A further aim of this invention is to provide longitudinal fixed guides designed to fold leaflets and hold them in position in preparation for insertion into their cartons.

Further features and advantages of the present invention are set forth in the following detailed description, where a preferred embodiment, only illustrative, is disclosed as an example with reference to the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of an automatic product packaging machine according to the present invention:

FIG. 2 is a cross-section side view of the machine shown in FIG. 1;

FIG. 2A is an enlarged view of the detail A in FIG 2;

FIG. 3 is a cross-section view along the line III—III in FIG. 1;

FIG. 4 is a cross-section view along the line IV—IV in FIG. 1;

FIG. 5 is a cross-section view along the line V—V in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a carton conveyor 1 with pre-formed, opened cartons 4 positioned at an equal distance to each other on the conveyor 1 and transported downstream along a packaging line in the direction indicated by the arrow F1. Alongside the conveyor 1 there is a second conveyor 2 carrying the products 5 aligned and on the same plane as the cartons 4 carried by the conveyor 1; the second conveyor 2 conveys the products 5, with at least their loading side open, downstream in the direction of the arrow F2. Alongside the conveyor 2 there are product loading means 3 consisting of pusher bars 6 which move longitudinally downstream in the direction of the arrow F3.

Given that the two conveyors 1 and 2 and the product loading means 3 move at the same speed and in the same direction as each other, the crossways alignment between the cartons 2, the products 5 and the pusher bars 6 remains constant along the entire length of the packaging line. In this way the loading means 3 move the pusher bars 6 sideways pushing the products 5 from the product conveyor 2 towards the carton conveyor 1 thus inserting the products 5 into their respective cartons 4.

Between the first carton conveyor 1 and the second product conveyor 2 there are leaflet conveying means 7 consisting of two, closed-loop belts 8 and 9 driven at the same speed as the packaging line and travelling on the same vertical plane as each other. On the upper part of vertical path travelled by the two belts 8 and 9 the inside surfaces of the two belts touch and adhere along a section longitudinally aligned with the packaging line. This section starts close to the leaflet 11 feed means 10 and finishes downstream of the packaging lines so that the leaflets 11 can be gripped between the two belts 8 and 9 along the section and can be carried along the packaging line at any distance whatsoever thus defining a continuous-grip leaflet conveyor line 27.

The belt 8 is guided along the leaflet conveyor line 27 by the height-adjustable pulleys 12, 13, 14, 15 and 16 and is supported by a pair of slide plates 17 and 18 which are also height adjustable for the reasons outlined below.

The belt 9 is guided along the leaflet conveyor line 27 by the pulleys 19 and 20 positioned at the ends of the path travelled by the first belt 8; the upper part of this path is fitted with a slide plate 21 for the reasons outlined below.

This layout means that the contact pressure between the belt strips 8 and 9 along the leaflet conveyor line 27 can be adjusted by changing the vertical adjustment of the pulleys 12, 13, 14, 15 and 16 and/or the vertical adjustment of the plates 17 and 18 thus varying the degree of adherence between the belts along the section where the two belts 8 and 9 are on top of each other.

During operation, the adherence between the belt strips 8 and 9 along the leaflet conveyor path 27 is greater in the initial zone and lesser in the final zone for the reasons described below.

Alongside the leaflet conveyor line 27 there is a fixed guide 22 which has a low section at the start of the leaflet conveyor line 27 and which then increases in height until it exceeds carton height and remains at this height until it is downstream of the packaging line for the reasons described below.

In order to feed leaflets 11 to the leaflet conveyor line 27, the leaflet feed means 10 picks up concertina-folded leaflets 11 from a folding unit usually of the GUK type (not shown here) by means of a conveyor 26 consisting of adhering belts 23 and 24. The conveyor 26 transports the leaflets 11 through a toothed timing station 25 to the leaflet conveyor line 27 placing the leaflets between the belts 8 and 9 so that they are coplanar with the belts at the start of the leaflet conveyor line 27 ready for transport along the packaging line. The toothed timing station 25 synchronises the leaflets 11 with the cartons 4 and the products 5 carried by the conveyors 1 and 2 thus feeding or stopping the leaflets 11 along the conveyor 26 so that the conveyor 26 feeds the leaflet conveyor line 27 in synchrony with the packaging line. During operation, leaflets are fed to the leaflet conveyor line 27 by the conveyor 26 and the leaflets are fed at the required distance to each other by the timing tooth 25. The leaflets are then gripped by the leaflet conveyor line 27 and immediately afterwards released by the conveyor belt 26. The leaflets are now horizontal to the packaging line with one end gripped between the belts 8 and 9 of the leaflet conveyor line 27; along this section of the line the contact pressure between the belts 8 and 9 is very strong. The other end of the leaflet 11 is free and during its longitudinal travel meets the lower part of the fixed guide 22. The leaflet is fed forward gripped between the belts 8 and 9 while its free end is forced to rise as it travels along the sloped, rising section of the guide 22. This action forms a fold in the leaflet close to the point where the leaflet is gripped by the leaflet conveyor line (see FIG. 3). As the leaflet continues to travel downstream this fold becomes increasingly more pronounced until the free end of the leaflet meets the horizontal section of the guide means 22; at this point the leaflet has a 90° fold (see FIG. 4). Downstream from this fold, pusher means 3 using pusher bars 6 push the product 5 from the conveyor 2 in the direction of the cartons 2 on the conveyor 1. During this movement the product 5 intercepts the leaflet 11 which is currently being held in a vertical position by the horizontal guide 22 and which is travelling longitudinally held by the conveyor line 27 which, in the meantime, has reduced the contact pressure between the belts 8 and 9. In FIG. 5, the product 5 has started to be inserted into its carton 4 taking with it the leaflet 11 which can easily be inserted into the carton because its lower part is already folded and gripped with minimum pressure by the conveyor line 27.

In a second version of the invention the leaflet conveyor line still consists of a pair of belts, one above the other with the same pressure characteristics as described above, but in this version the belts are rotated through 90° (with respect to the version described above) so that the "width" of the belts 8 and 9 is vertical to the packaging line. In this second version, the leaflets 11 are positioned vertically upright along the packaging line and can be transported together with the products using the differential grip characteristics of the leaflet conveyor 27.

When a size-changeover operation is necessary, the leaflet conveyor line does not require changing and any new spacing required between one leaflet and another to match the new spacing of the cartons and products is obtained by simply adjusting the leaflet timing tooth.

The above description is intended as an example only and is in no way restrictive; any modifications thereto fall within the scope of the above description and the appended claims.

What is claimed is:

1. A product and leaflet packaging system comprising:

a carton conveyor;

a product conveyor extending parallel to said carton conveyor along at least a packaging path;

product loading means disposed along said packaging path for loading products from said product conveyor into respective cartons on said carton conveyor; and

leaflet conveyor means located between said carton conveyor and said product conveyor along said packaging path for transporting leaflets adjacent to the product loading means, the leaflets being inserted into said cartons, through contact with respective products, as said products are loaded into their respective cartons by said product loading means, said leaflet conveyor means including a pair of coacting belts extending parallel to one another and to said packaging path, said belts being in contact with one another along said packaging path, whereby the leaflets are gripped and transported between and by said belts.

2. The system defined in claim 1, wherein said belts extend essentially in a common plane parallel to said carton conveyor and said product conveyor along said packaging path, further comprising means for bending a portion of each given leaflet from said plane into an essentially orthogonal plane between said carton conveyor and said product conveyor along said packaging path, while another portion of said given leaflet remains gripped by said belts in said common plane.

3. The system defined in claim 2, wherein said means for bending includes a stationary guide bar of a fixed shape.

4. The system defined in claim 1, wherein said belts are coplanar closed-loop belts having inner surfaces touching along a section so as to define a leaflet conveyor line.

5. The system defined in claim 1, further comprising a plurality of adjustable support plates fitted to said belts to enable adjustment of the adherence between said belts along said packaging path.

6. The system defined in claim 1, further comprising adjustable guide pulleys engaging said belts to enable adjustment of the adherence between said belts along said packaging path.

7. The system defined in claim 1, further comprising fixed longitudinal guide means for folding leaflets and holding them in position in preparation for insertion into respective cartons.

* * * * *

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Petry et al.

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[45] Date of Patent: Jan. 5, 1993

[54] FEED STATION FOR FOLDING BOXES

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[30] Foreign Application Priority Data

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[51] Int. Cl.[5] B65B 43/39

[52] U.S. Cl. 53/252; 53/382.2; 53/387.2; 53/566

[58] Field of Search 53/251, 252, 382.1, 53/382.2, 382.3, 387.2, 566

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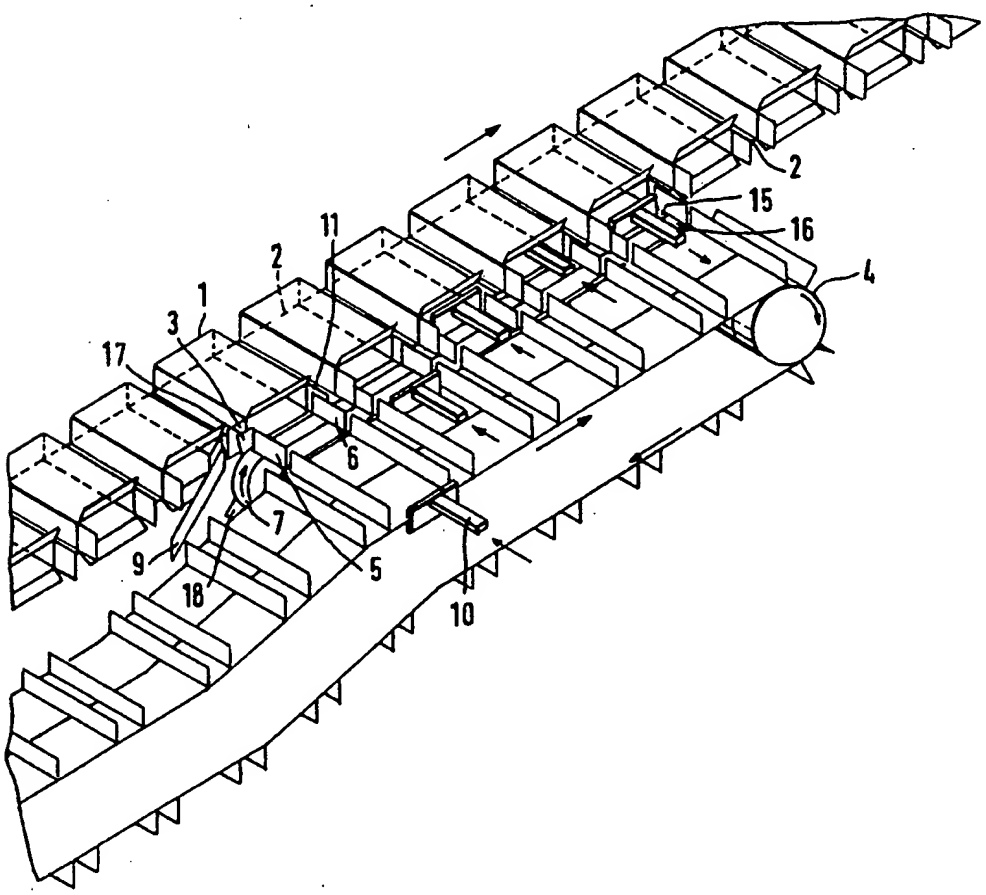
[57] ABSTRACT

A feed station having a plate-retaining device which consists of a stationary guide arranged in front of or preceding the bridging belt for folding or swinging the side edge flaps of the folded box during an abutting thereof to a position wherein the plane thereof is parallel with respect to the direction of transport or movement. An additional guide plate oriented in a processing position subsequent to the stationary guide is provided, which guide plate is moved to hold the side edge flap of the folded box, which side edge flap is a trailing flap, open until the respective rear or trailing guide plate for the goods is oriented in front of the corresponding side edge flap.

7 Claims, 3 Drawing Sheets



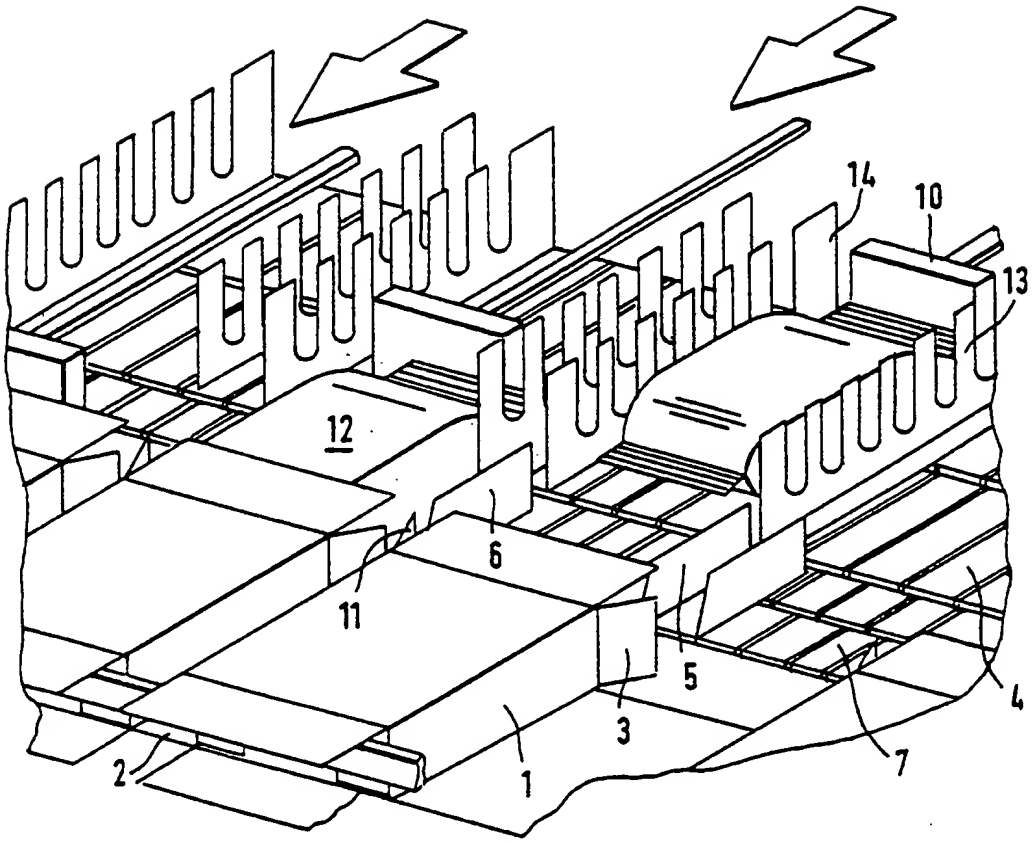


FIG.1

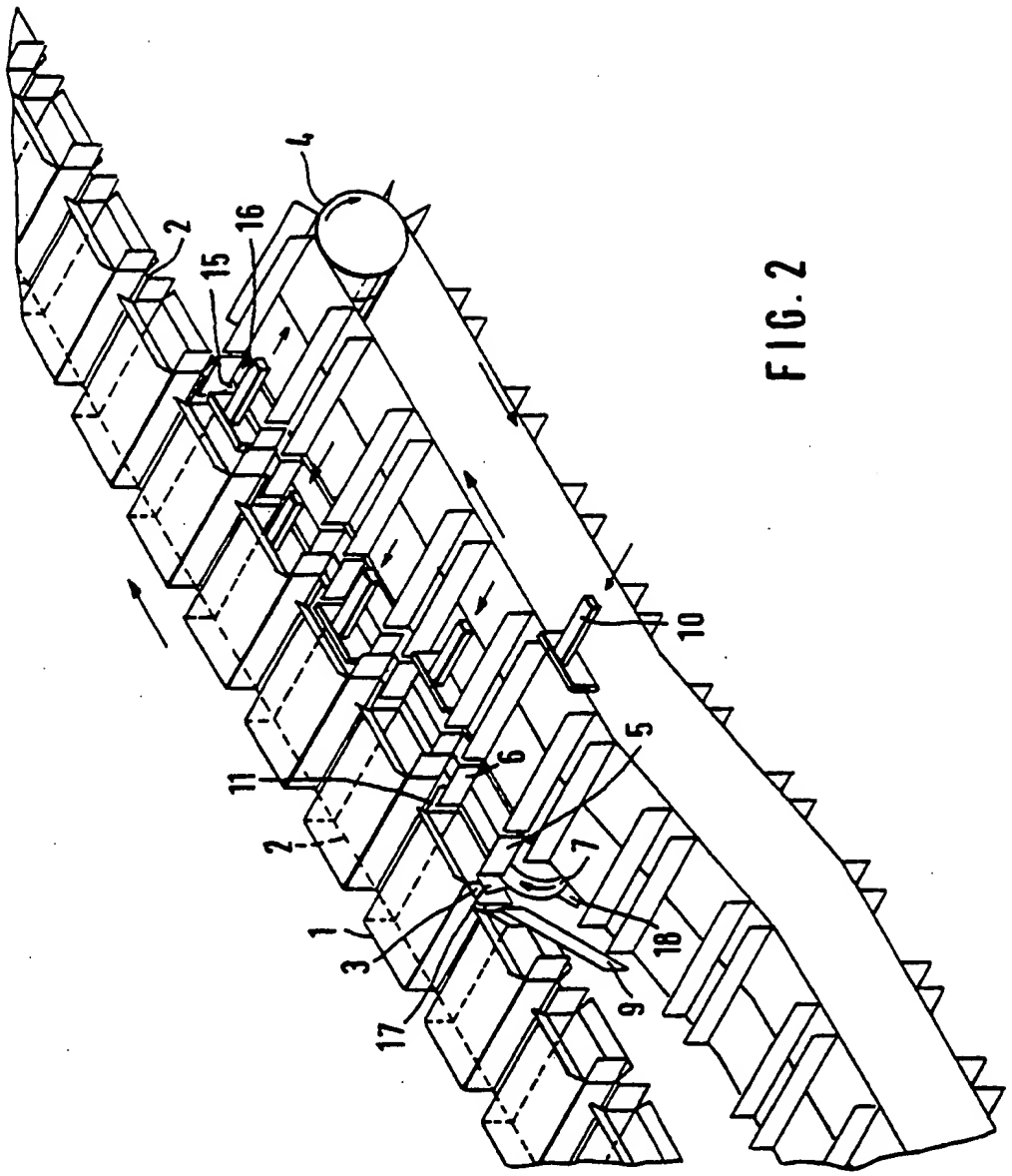


FIG. 2

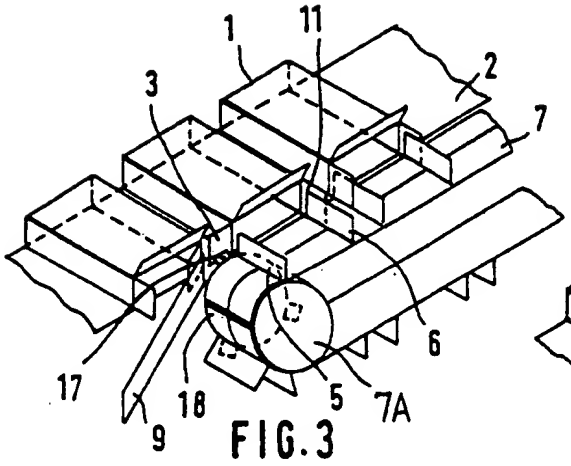


FIG.3

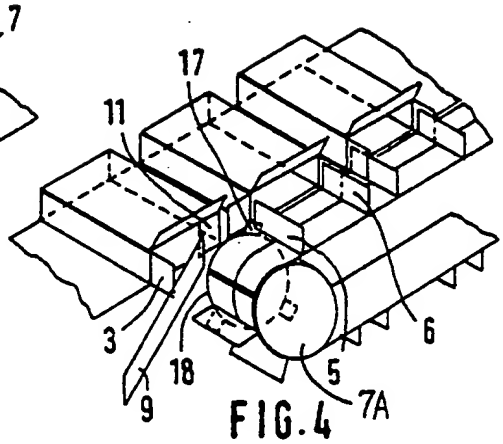


FIG.4

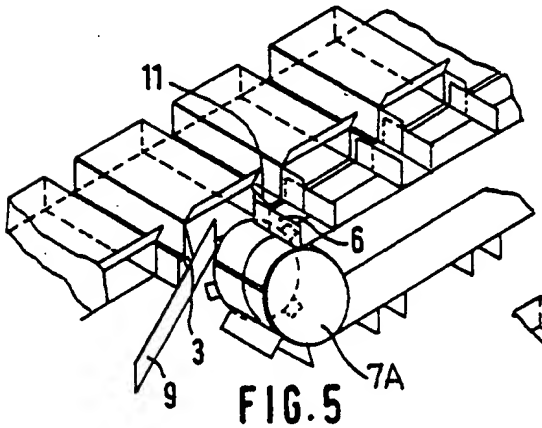


FIG.5

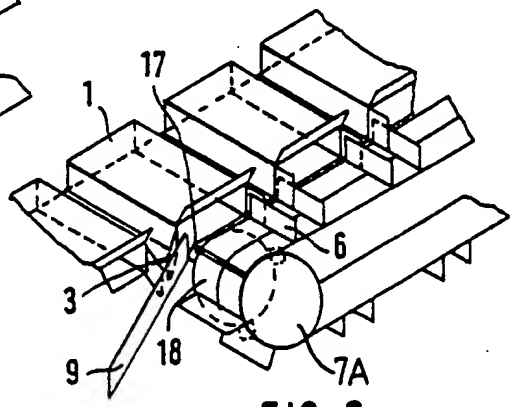


FIG.6

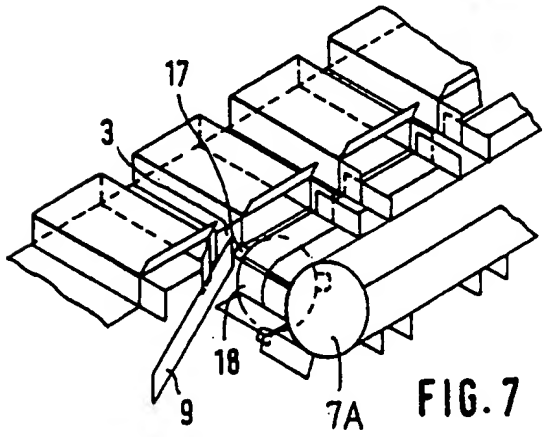


FIG.7

FEED STATION FOR FOLDING BOXES

FIELD OF THE INVENTION

The invention relates to a feed station for folded boxes comprising a transport device which includes a first conveyor belt for the folded boxes, which boxes are open on at least one end, a second conveyor belt for carrying the goods to be inserted into the boxes, which second conveyor is arranged parallel to the first conveyor and is moved synchronously therewith, a bridging belt oriented between the first and second conveyor belts and extends parallel to the first and second conveyor belts and is driven synchronously therewith, which bridging belt has guide plates for laterally limiting the slide-in path of the goods into the folded boxes, and a reciprocal slide-in device for moving the goods into the folded boxes.

BACKGROUND OF THE INVENTION

In a feed station, in which the goods supplied by a separate conveyor belt are moved into folded boxes supplied by a second conveyor belt, it must be guaranteed, in order to achieve a smooth sequence of operation, that the goods when being moved into the boxes, do not run up against the side edge flaps of the box. It is known for this purpose to arrange a bridging belt between the conveyor belt for the folded boxes and the conveyor belt for the goods, which bridging belt has two lateral guide plates each facilitating a guiding and sliding of the goods into the box. The guide plates on the bridging belt must be aligned with respect to the folded boxes such that their side edge flaps each become oriented on the outer oppositely facing sides of the guide plates of the bridging belt. It must be assured here that at the moment when the guide plates are oriented in front of the opening into the folded box, the side edge flaps also lie on the respectively correct side of the guide plates.

It is known to arrange the guide plates for the side edge flap of the folded box, which side edge flap is oriented in front of and leads the guide plate on the bridging belt itself, while the guide plate for the trailing side edge flap of the folded box is arranged on a separate upper belt which runs synchronously above the bridging belt and the two other conveyor belts. The disadvantage of this solution is that a gap is formed automatically between the side plate of the upper belt and the bridging belt, thus there exists the danger that the goods can become jammed during the process of sliding into the box.

SUMMARY OF THE INVENTION

The basic purpose of the invention is to provide a feed station of the above-mentioned type such that same, on the one hand, is simpler in its design and thus less expensive and, on the other hand, the danger of jamming during a sliding of the goods into the folded box is avoided.

This purpose is attained according to the invention by the feed station having a plate-retaining means which consists of a stationary guide arranged in front of or preceding the bridging belt for folding or swinging the side edge flaps of the folded box during an abutting thereof to a position wherein the plane thereof is parallel with respect to the direction of transport or movement, and an additional guide plate oriented in a processing position subsequent to the stationary guide, which guide plate is moved to hold the side edge flap of the folded box, which side edge flap is a trailing flap, open until the respective rear or trailing guide plate for the goods is oriented in front of the corresponding side edge flap.

Thus, both upstanding partitioning guide plates for the goods to be moved into a folded box are, in the case of the feed station designed according to the invention, arranged on the bridging belt. Yet, in order to assure that the side edge flaps of the folded boxes lie each on the outer leading and trailing sides of the corresponding guide plates of the bridging belt, a stationary guide pressing the side edge flaps back is provided, which stationary guide cooperates with moving guide plates moved synchronously each with the rear or trailing side edge flap of a folded box so that the rear or trailing side edge flap swung by the stationary guide is held in this position by the moving guide plate until the upstanding partitioning guide plate on the bridging belt has assumed a position in which the side edge flap of the folded box lies on the outer or trailing side of the trailing partitioning guide plate. The moving guide plates are advantageously fastened on a wheel, arranged between the bridging belt and the conveyor belt for the folded boxes. The guide plates extend over a specific angle sector of the wheel. Two or more guide plates can thereby also be provided on the wheel.

The bridging belt is advantageously designed in two parts, namely, the front (leading) and the rear (trailing) partitioning guide plates are each arranged on a respective different one of the two parallel running parts of the bridging belt. This design has the advantage that the distance between the partitioning guide plates can be adjusted relatively to one another by moving the belts in a lengthwise direction relative to one another in order to adjust the format or spacing therebetween.

BRIEF DESCRIPTION OF THE DRAWINGS

One exemplary embodiment of the invention will be described in greater detail hereinafter in connection with the drawings, in which:

FIG. 1 is a perspective illustration of a feed station embodying the invention; and

FIGS. 2 to 7 illustrate the feed station according to FIG. 1 in a time related sequence causing the guide plates on the bridging belt to become oriented in between the side edge flaps on the folded box.

DETAILED DESCRIPTION

As shown in a perspective view of a feed station according to the invention illustrated in FIG. 1, a conveyor belt 2 in the form of a driving chain is provided onto which a partially folded box 1 is placed. The partially folded box 1 can either be open at both ends or, however, it can be opened at only one end, as this is shown in FIG. 2. A further conveyor belt 4 is arranged parallel to the conveyor belt 2, which further conveyor belt is constructed as a partitioned belt and receives between upstanding partitioning walls 13,14 the goods 12 to be inserted into the open end of the box. The conveyor belt 2 and the conveyor belt 4 are moved synchronously with one another so that opposing each associated folded box 1 is the goods 12 which is to be inserted into the associated box. In the exemplary embodiment, the goods are prepackaged in a bag. A bridging belt 7 is arranged between the two conveyor belts 2,4, which belt 7 lies also parallel and is driven synchro-

nously with the two conveyor belts 2,4. The bridging belt 7 is supported on guide rollers, one of the guide rollers 7A being shown in each of FIGS. 3-7. The bridging belt 7 has upstanding guide plates 5,6 thereon arranged and aligned in parallel with respect to the upstanding partitioning walls 13,14 on the conveyor belt 4.

The bridging belt 7 actually consists of two belts 15,16, which are driven synchronously, however, can be adjusted in the lengthwise direction relative to one another. The guide plate 5,6 are each arranged on separate belts 15,16 so that by a relative adjustment of the belts with respect to one another, the distance between the guide plates and thus the format can be adjusted. The conveyor belt 4 is designed accordingly so that the size of the slide-in area can be adjusted to the respective width of the goods. The prepackaged goods is moved into the open end of the box with the help of a reciprocal ram 10.

Since the guide plates 5,6 are spaced only a relatively short distance from the open end of the folded box 1, and since the side edge flaps 3,11 of the box grip behind the guide plates 5,6, attention must be paid during the feeding in of the guide plates 5,6 that the side edge flaps 3 and 11 of the folded box 1 rest in each case on the outer sides of the guide plates 5,6.

A stationarily arranged guide 9 is provided and is used to align the side edge flaps 3,11 of the folded box 1, which guide 9 is arranged inclined with respect to a forward direction of movement of the folded boxes to cause the side edge flaps 3,11, when engaged by the guide 9, to each be folded in a rearward direction relative to the direction of movement of the boxes. The guide 9 is of no significance for the front or leading side edge flap 11, because same will, immediately after passing the guide 9, be folded into its original position so that the front or leading guide plate 6 approaching it from the rearwardly facing side can take a position behind the side edge flap to cause it to become oriented on the outer side of the guide plate 6.

The guide 9, however, is not sufficient to guarantee that the trailing side edge flap 3 of the folded box 1 rests on the outer side of the rear or trailing guide plate 5. In order for the rear or trailing side edge flap 3 to be held open for a longer period of time, namely, until the rear or trailing guide plate 5 on the bridging belt has passed the open side edge flap 3, plural guide plates 17 are provided, which guide plates are each fastened to a driven wheel 18 arranged between the bridging belt 7 and the conveyor belt 2 and oriented so that an axis of the wheel 18 is coaxial with respect to an axis of the guide roller 7A. The guide plates on the wheel 18 each have a guide surface substantially aligned with the plane of the wheel, which guide surfaces 17 become positioned in front of the trailing side edge flap 3 of the folded box 1, which side edge flap has been previously urged by the guide 9 toward the rear, to hold the side edge flap 3 open for a longer time interval until the rear or trailing guide plate 5 on the bridging belt has passed the side edge flap 3. The peripheral speed of the wheel 18 is greater than the speed of the bridging belt 7. This guarantees that the side edge flaps 3, with certainty, become oriented on the outer or trailing side of the guide plate 5. After the two guide plates 5 and 6 each lie between the two side edge flaps 3 and 11, the goods 12 can be inserted into the open end of the box by means of the reciprocal ram 10.

FIGS. 3 to 7 illustrate in individual method steps the sequential positioning of the guide plates 5,6 between the two side edge flaps 3,11 of the folded box. FIG. 3 shows how the front or leading side edge flap 11 is folded first rearwardly by the guide 9. FIG. 4 shows the folded side edge flap 11 shortly before it is again released by the guide 9. FIG. 5 shows how the front or leading guide plate 6 grips behind the side edge flap 11. The trailing side edge flap 3 then abuts the guide 9 and is moved rearwardly by the guide 9.

This process has further advanced in FIG. 6, namely, the front or leading guide plate 6 has here assumed its final position, that is, it is now aligned parallel to the leading wall of the opening into the folded box 1. The rear or trailing flap 3 is further opened. FIG. 7 shows how the rear or trailing side edge flap 3 still being held by the guide 9 is already being held by the guide plate 17. The side edge flap 3, as shown in FIG. 3, is thereby held back away from the opening into the box until the rear or trailing guide plate 5 of the bridging belt 7 has passed the trailing side edge flap 3. The rear or trailing side edge flap 3 is thereafter released, as this is shown in FIGS. 4 and 5, so that same becomes oriented against the outer trailing side of the guide plate 5.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a feed station for placing goods into folded boxes having first and second side edge flaps thereon comprising a transport device including a first conveyor belt for the folded boxes, which boxes are each open on at least one end, the first side edge flap, as the box moves in a selected direction of movement, leading the second side edge flap, a second conveyor belt for supplying the goods to be placed into the boxes. which second conveyor belt is arranged parallel to the first conveyor belt and is moved synchronously therewith, a bridging belt oriented between the first and second conveyor belts and extending parallel thereto and driven synchronously therewith, which bridging belt has upstanding leading and trailing partitioning guide plates for laterally limiting a slide-in path of the goods into the folded boxes, and a slide-in device for moving the goods into the folded boxes, the improvement wherein the feed station has a flap-retaining means comprising a guide stationarily arranged in front of and upstream of the bridging belt for swinging the first and second side edge flaps of the folded box, during abutment therewith, to a position oriented parallel with respect to the direction of movement of the boxes and wherein said flap retaining means further includes a moving guide plate oriented in a processing position downstream to the stationary guide, which moving guide plate holds the second side edge flap of the folded box, which second side edge flap is a trailing flap, away from the box opening until the respective trailing partitioning guide plate for the goods lies in front of the corresponding second side edge flap.

2. The feed station according to claim 1, wherein the moving guide plate is fastened adjacent the periphery of a wheel and a surface thereon extends substantially parallel with respect to a plane of the wheel, the wheel

being arranged between the conveyor belt for the folded boxes and the bridging belt.

3. The feed station according to claim 2, wherein several moving guide plates are arranged on the wheel.

4. The feed station according to claim 2, wherein an axis of the wheel is arranged coaxially with respect to guide rollers for the bridging belt.

5. The feed station according to claim 2, wherein the peripheral speed of the wheel is greater than the speed of the bridging belt.

6. The feed station according to claim 1, wherein the bridging belt consists of two parallel extending belts, of which one has the leading guide plate thereon and the other one has the trailing guide plate thereon for the goods.

7. The feed station according to claim 6, wherein the two parallel belts forming the bridging belt can be adjusted with respect to one another in order to adjust the spacing between the upstanding guide plates.

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